

IDENTIFYING KEY CHALLENGES AND ISSUES IN CROWD MANAGEMENT DURING HAJJ EVENT IN SAUDI ARABIA

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ABSTRACT: The Hajj is the major gathering of Muslims from all around the world. Saudi Arabia provides several services to facilitate the Hajj and Umrah rites. Additionally, it strives to make the Hajj season more prosperous each year. Nonetheless, Hajj agencies and pilgrims continue to face hurdles, such as crowding issues, managing and planning campaigns, and communication difficulties between organizers and pilgrims. This study article demonstrates the challenges agencies and pilgrims experience and how these difficulties impact the overall management of crowds throughout the Hajj season. Utilizing a questionnaire, 321 pilgrims and 17 agencies that facilitate Umrah and Hajj activities provided data. The acquired data were further examined using descriptive statistics. The researcher interviewed two Hajj and Umrah service specialists to gain a deeper understanding. In the concluding section of the study, significant results and consequences for practitioners are offered.

Keywords: Hajj; Umrah; pilgrims; organizers; hajj agencies; crowds; crowd management

1. Introduction

Crowd management is a complex process that includes multiple disciplines, particularly crowd management at religious meetings, which is one of the greatest issues governments face on a global scale. This paper examines the Hajj as a case study of the process of crowd management in religious events. Pilgrims congregate in Saudi Arabia to complete their rites at a specific time during Hajj. In the early days of the Islamic month of Dhul-Hijjah, Muslims' hearts are filled with longing and hope for the Hajj, and they turn their gaze towards the Holy House of God. Hajj is the fifth pillar of Islam's five pillars and one of God's great ceremonies. It is also regarded as the largest Islamic gathering that brings together Muslims of various nations and cultures worldwide. In 1365 AH, the Kingdom of Saudi Arabia established the Ministry of Hajj and Umrah to facilitate pilgrims' performance of this obligation. The Kingdom's significant efforts to serve pilgrims are appreciated and respected by Muslims worldwide for the care and attention given to pilgrims from their arrival until the conclusion of their rituals.

In the previous 50 years, the Kingdom of Saudi Arabia has received 95,853,017 pilgrims (General Authority for Statistics, 2015), surpassing two million in 19 seasons. Following the Kingdom's Vision 2030, special activities and services continue to be provided to Holy Land visitors. The strategic objective of the Ministry of Hajj and Umrah is to enable the largest number of Muslims from all over the world to perform the Hajj and Umrah rituals and to make this journey of faith, whether for Hajj or Umrah, easy with a sense of peace and rest so that they can share their experience and the efforts made by the Kingdom in serving the pilgrims with the world.

Despite the yearly influx of pilgrims, the Kingdom is making every effort to conclude the Hajj season. Yet, certain Hajj and Umrah institution organizers face difficulties coordinating and planning their campaigns. Typically, the organizer relies on a paper system to manage and monitor its groups of pilgrims, such as managing hotel booking, issuing Hajj permits, transportation system, and official documents for pilgrims (passport, visa). From this system, they emerged the most critical challenges facing the organizers of these establishments, such as the loss of the most important documents related to the pilgrims, the difficulty in organizing groups, and communication with pilgrims. The Hajj still lacks adequate crowd management, hence increasing the likelihood of crowd-related calamities due to the cumulative obstacles and issues faced by Hajj organizations and agencies.

This study examines the major obstacles and concerns faced by Hajj agencies in Saudi Arabia and their influence on the crowd control process. The structure of this document is as follows: In Section II, a review of the available literature on the management of crowds in various regions of the world is presented. In Section III, the process for collecting data on crowd control is outlined. In Section IV, an analysis discussion is provided. In section V, the conclusion is drawn.

2. Literature review

Throughout the world, public meetings during events attract crowds. These events may be religious, social, political, sports, or musical performances. In certain circumstances, large crowds can be aggressive, resulting in anarchy, loss of life, the spreading of contagious diseases, and other catastrophes. This

section examines the process of crowd control as well as some of the tactics utilized and recommended for effective crowd management at religious meetings.

Crowds' Management Process

During religious gatherings, most of the world's stampedes occur in India and Saudi Arabia. Insufficient crowd control caused 106 deaths and 383 injuries at the Puttingal Devi temple incidents in India in 2016. During the 2015 Hajj season, Saudi Arabia saw one of the highest mortality tolls in decades, notably in Mina, where 1,100 to 2,431 pilgrims perished, and more than 934 were injured (Al-Dalaeen & Tarawneh, 2022; Al-Shammari & AlShowaikh, 2021; Islam et al., 2019). Sports, entertainment, and festival events attract crowds. Yet, between 1883 and 2017, religious events caused 64 percent of all deaths and 51 percent of all injuries, and the stampede claimed the lives of many individuals. However, crowd management is a sophisticated process requiring a combination of engineering and computer science; it is also essential for preventing mass disasters. According to Sharma et al. (2018), the three primary phases of an effective crowd control method are pre-event, during-event, and post-event.

A crowd simulation under various crowd scenarios and conditions is performed in the pre-event planning phase. Based on the simulation results, the optimal

route for crowd movement is determined, along with infrastructure improvements such as increasing space, opening entrances, or closing exits (if required). During the next phase, events are monitored and controlled by collecting, storing, and analyzing crowd information using three leading technologies for the acquisition of crowd data: vision-based technologies (e.g., CCTV monitoring), Wireless/Radio-frequency (RF), e.g., mobile phones, and Web/Social media data mining. Due to its impact on decision-making efficacy to prevent crowd tragedies, this data collection is an integral aspect of managing crowds. In addition, the system's effectiveness greatly depends on the precision of crowd information about the monitored area (Algumzi, 2022; Alqasa & Afaneh, 2022; Franke, Lukowicz, & Blanke, 2015).

As depicted in Figure 1, input is considered in the final phase of the crowd management process, and lessons gained are recorded to improve future systems.

Crowd management at religious gatherings

The majority of packed events occur at religious gatherings. With about 120 million pilgrims in 2013 and 60-80 million pilgrims in 2010, India's Kumbh Mela religious celebration ranks first and second in the world's largest gatherings (Levin, 2020). Hence, 79% of stampede incidents in India are caused by religious groups (Ameer et al., 2022; Gayathri, Aparna, & Verma, 2017).

The Kumbh Mela, a Hindu religious festival, is celebrated four times every 12 years in four distinct central locations, three years apart (Yamin, 2019). Packed gatherings are difficult to manage and regulate, resulting in several mismanagement-related catastrophes. In addition, the April 2021 Kumbh Mela event generated a significant increase in Covid-19 instances in India, which surpassed the threshold of 4,000 positive cases. Now, it is responsible for more than 2,000 deaths. Figure 2 depicts the large increase in cases of Corona during and after the incident (Rocha, Pelayo, & Rackimuthu, 2021). Effective crowd control at religious gatherings has become a prerequisite in every nation that hosts such events. In recent years, the Indian government has embraced technological solutions to help manage enormous crowds, with 2019 marking the first time artificial intelligence was used at the Kumbh Mela. During the event, more than 1,100 CCTV cameras were employed to monitor the crowd's movements. In addition to the establishment of the Digital Lost Center to reduce the problems of losing people or personal property, more than 14 telephone numbers were posted on various buildings to report a missing person and provide their specifics to the center so that this report could be displayed on screens in multiple locations to aid in finding them (Andrade-Vargas et al., 2021; Arcila-Calderón et al., 2022; Rajak, Mallick, & Gaurav, 2021).

In addition, the Sabarimala Temple is considered a location for religious gatherings in India. The Sabarimala Pilgrimage has a history of crowd-related mishaps. Using the crowd-carrying capacity

assessment (CCCA) paradigm, Illiyas, Mani, and Babu (2021) analyzed crowd movement in Sabarimala to determine pilgrim density and threshold limits for crowd accommodation. Four phases comprise the CCCA procedure: area, zones, density, and capacity. According to studies, the physical carrying capacity limit at any given time is 55,989 pilgrims. The adequate carrying capacity of the Sabarimala pilgrimage is 70,500 per day, representing 61% of the physical carrying capacity.

Likewise, during the Hajj season, Saudi Arabia deployed RFID, a tool for identifying and tracking pilgrims, to better manage pilgrims and prevent crowd problems (Arede, Cumming, & Leite, 2021; Berrichea et al., 2015).

Crowds' Management in Saudi Arabia

The accomplishments and implementation of expanding projects have made Saudi Arabia the world's leader in crowd management. Many incidents have been successfully addressed in recent years. Via the opening parade, the opening ceremony of Riyadh Season 2021 was attended by a global audience that exceeded 750,000 people (Taha, 2021). In addition, thousands of visitors participated in the International Book Expo over ten days. The crowd management plan includes staffing requirements and staff training to implement a crowd management plan tailored to the demands of the event organizer, as well as security measures, cultural considerations, and a well-managed event (Arora & Manchanda, 2021; Crowdsafety, 2016).

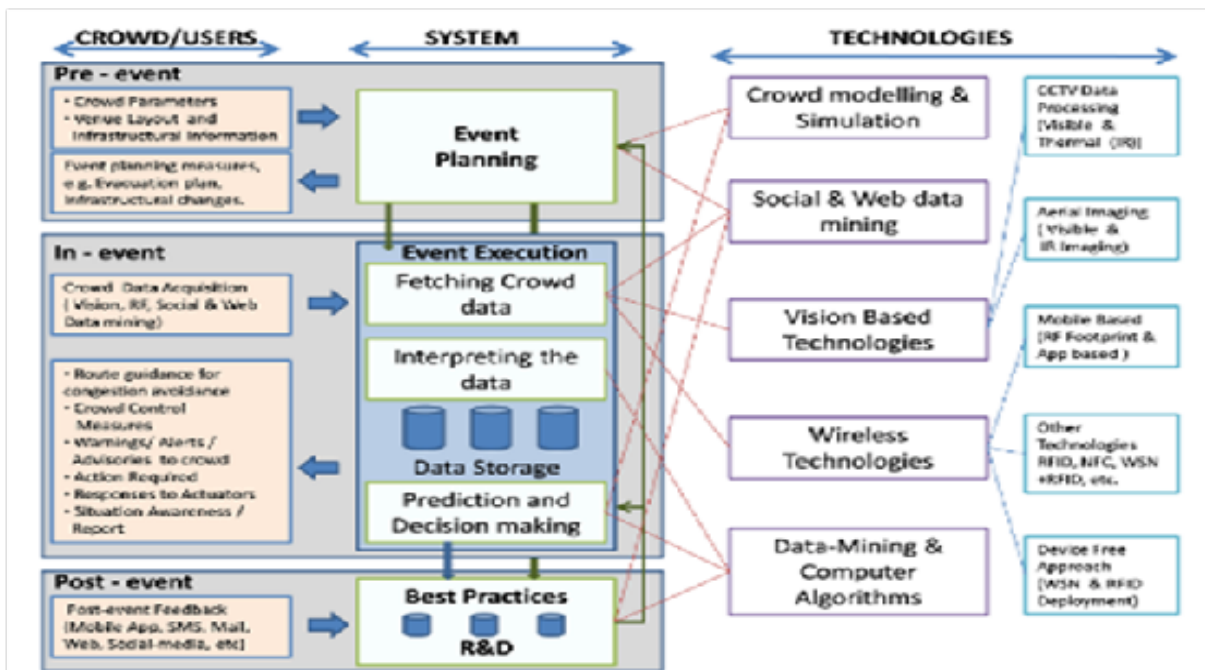


Figure 1. The technological aspect of crowd management systems during different phases (Sharma et al., 2018)

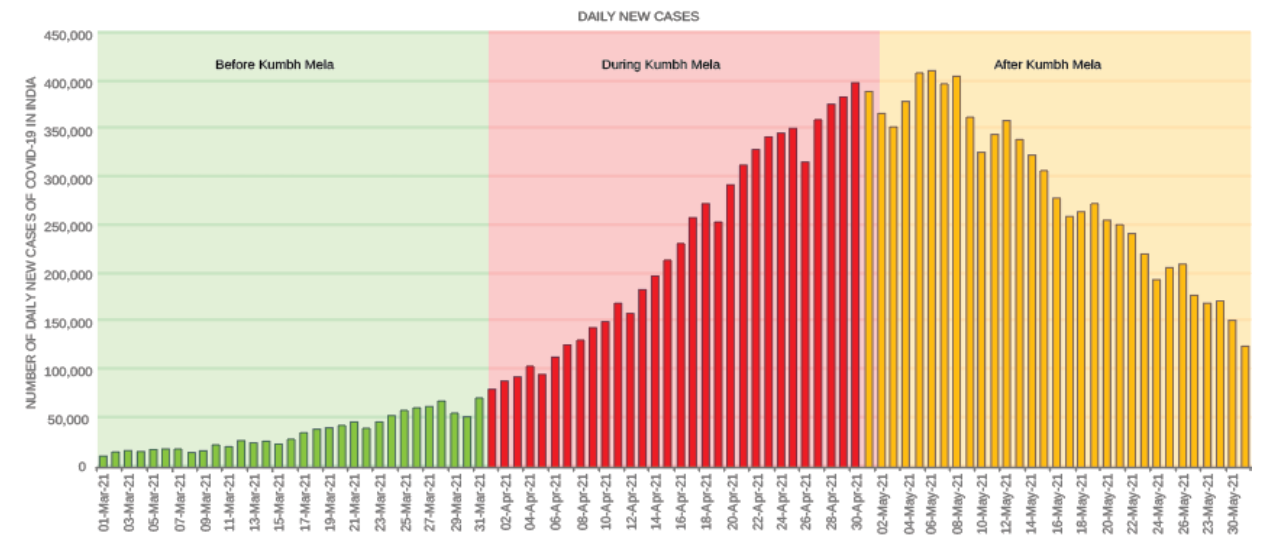


Fig. 2. Daily new cases of COVID-19 in India before (March 1–31, 2021), during (April 1–30, 2021), and after (May 1–31, 2021) Kumbh Mela

Crowds' management during Hajj/Umrah

Every year, Saudi Arabia celebrates the major Islamic celebration (Hajj), one of the world's most populous gatherings. Hajj has a history of stampedes and fatal events from the beginning of the 2000s until the most recent stampede in 2015, with more than 2,700 deaths (Vanumu, Laxmikant, & Rao, 2020). The stampede was described as the biggest crowd tragedy in the history of the Hajj and ranked as the season with the highest number of deaths and injuries (Sim & Mackie, 2015). After 2015, Saudi Arabia made substantial technological and engineering advancements. In light of technological advancements, over a thousand new surveillance cameras have been deployed (Sharma et al., 2018). Additionally, a Radio-Frequency Identification (RFID) wristband, an electronic bracelet-based solution, has been launched for Hajj pilgrims to help authorities identify and treat them in an emergency (Yamin, 2019).

Felemban et al. (2020a) also built and utilized a mobile application during Hajj 2019. The Hajj organizers use it to comprehend crowd mobility behavior better, display the Ministry of Hajj and Umrah's timeline for the route to the Jamarat building, and assess compliance. Moreover, Saudi Arabia has developed numerous smartphone applications for Hajj and Umrah that support various languages, like Manasikana, Al-mutawf, Al-Haramain, etc. Haase also introduced an operational research-based decision support system for crowd control. Using scheduling tools and a real-time video tracking system (video-based counting system VBCS) to ensure a smooth flow of pilgrims and offer real-time statistics for an early warning system, this method proved efficient in preventing the loss of life (Arrotéia et al., 2022; Felemban et al., 2020b).

A convolutional neural network (CNN)-based crowd control system is also proposed in the literature (Albattah et al., 2020), with cameras set in numerous sections of the Al-Jamarat Stoning trail. These cameras were equipped with five-color warning lights above the moving crowd to cover each location and capture an image of the crowd every few seconds, which was then categorized according to the five colors. In addition, the picture categorization determines the hue of lights in the preceding region, not the region captured by the current camera. A signal is transmitted to the previous zone's warning lights in a crowded area. If it is red, the area is densely populated, brown for densely populated, yellow for semi-densely populated, blue for light, and green for ordinary areas. The solution seeks to maintain as close to typical crowd movement as feasible.

Regarding the engineering modifications, the Saudi Arabian government initiated one of the largest Hajj infrastructure projects. After the Hajj in January 2006, the old bridge was demolished, and construction of a new multi-level bridge began. The flooring was completed in time for Hajj 2009/2010. The huge bridge can accommodate 300,000 pilgrims each hour. It includes five levels. Each story is 12 meters tall to accommodate, if necessary, five million pilgrims in the future. The complex offers all the required services to assist pilgrims, including an underground tunnel that separates automobiles from pedestrians, 11 entrances, 12 exits, an emergency helipad, and advanced cooling technology. In addition to this endeavor, they implemented other measures to prevent crowd accidents (Jeavans, 2015).

Hajj/Umrah agencies

There is little doubt that Saudi Arabia's contributions have helped modernize digital solutions to become a global leader in crowd control (Arab News, 2021). Yet, the Saudi government faces several control-related concerns, including the following: With such a large number of pilgrims in the holy city, it is difficult to organize the crowd, especially given the geographical area for pilgrim movement, the fixed underlying road-network infrastructure between the various worship sites, and the need to avoid control issues that led to fatal accidents among pilgrims. In addition, the primary cause of crowds is that pilgrims are frequently separated from their groups. So, it takes time to identify them, particularly if they do not speak English or Arabic or if the pilgrim travels independently without alerting the group organizers. In addition, the pilgrims' disregard for the schedules and ignorance of the Hajj and Umrah rituals are the leading causes of their loss. The pilgrim's agency should consider creating a method for communicating with people with specific requirements, identifying those with significant contagious diseases, isolating them from other pilgrims, and protecting them. The agencies are responsible for providing a comfortable and secure environment, and determining, delivering, and conveying client value are key components of providing satisfactory services for every agency. Relationships between consumer expectation, satisfaction, loyalty to travel agencies, customer post-purchase value, and consumer trust are the research focus (Oktora & Achyar, 2014).

In Relationship Marketing, the capacity to meet client expectations is one of the most important factors for fostering long-lasting connections. Every travel agency offers a variety of packages, and consumers

select those that provide the greatest value, which is the sum of tangible and intangible product benefits and expenses (Kottler & Keller, 2009).

A study conducted by Zeithaml, Bitner, and Gremler (2010) classified these dimensions of perceived value into six points, consisting of:

- The functional significance of the Travel agency (installation).
- The functional value of the contact Personnel of the Travel agency (professionalism).
- The functional value of the Tourism Package purchased (Quality).
- The functional value of Price.
- Emotional value.
- Social value.

Client satisfaction, trust, and dedication are requisites for agencies to contemplate a long-term partnership (Moliner et al., 2007). According to a study by Shambour and Gutub (2022), service providers must address four primary research fields to create the optimum client experience:

- The two holy mosques and the holy sites (Location-based studies).

- The pre-arrival studies (Logistics investigation).
- Housing and services studies (Community and social studies).
- Transportation and crowd management (Human movement/transportation).

During Hajj and Umrah, difficulties may arise, such as pilgrims becoming lost or missing or lacking awareness regarding Hajj and Umrah practices and prayers. One of the services suggested to the agencies is the provision of an application to assist with pilgrim organization. A study by Budiawan and Afrianto (2020) demonstrates that to solve this issue, having an app technology that utilizes Geofencing, Google Maps API, and FCM can improve the organization of pilgrims by allowing the location of each pilgrim to be assigned and by assisting mentors in monitoring pilgrims so that pilgrims have a thorough understanding of the Hajj and Umrah practices.

3. Methodology

For our investigation, we utilized two distinct strategies for data gathering. The first is a survey based on a questionnaire with two main categories: pilgrims and Saudi Arabian Hajj agencies. The article's taxonomy is depicted in Figure 3.

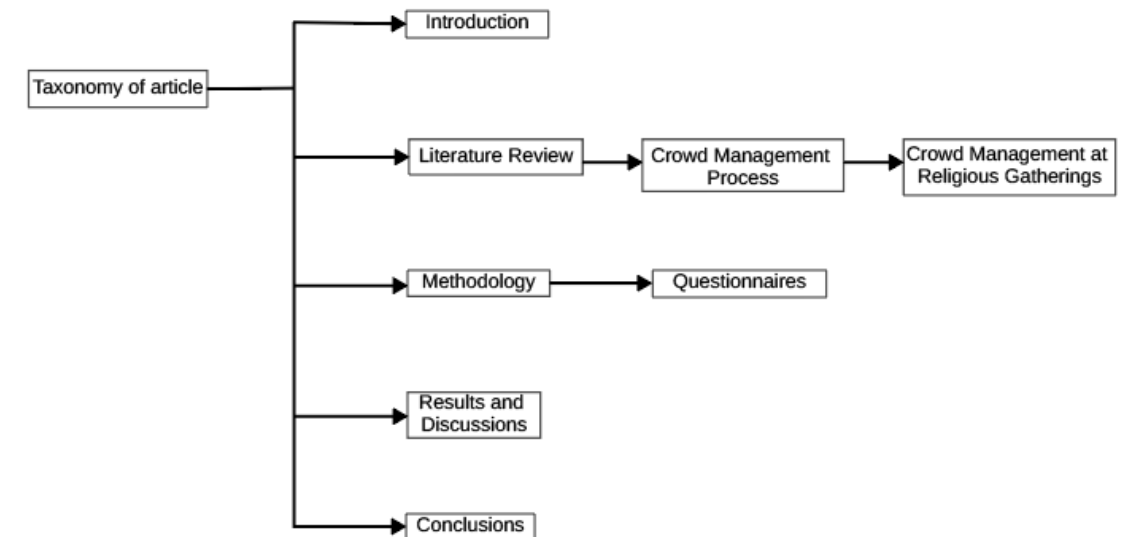


Fig. 3: Taxonomy of the article

The quantitative analysis is based on two questions; the first questionnaire targeted external and internal travelers, was developed in Arabic and English, and measured the extent to which pilgrims were satisfied

with the services given by the agencies. In addition, the second questionnaire is sent to Hajj agencies to learn about the issues and difficulties during the Hajj season.

Using Google forms, an online survey questionnaire was developed to be filled out online. In addition, the survey responses were kept and utilized in subsequent polls to determine whether the organization's administrator had made any progress. The response rate for the first target category (pilgrims) was 321, while the response rate for the second target group (Hajj agencies) was 17.

Participants could quickly participate in the survey because it was on social media, which they could access from anywhere. For this reason, the entire survey questionnaire was broken into several sub-sections that catered to specific genders, ages, and nations. The questionnaire consisted of items respondents were instructed to respond with strongly disagree, disagree, agree, and strongly agree. The following findings and discussion section is a full summary of the input from pilgrims and organizations.

The second method consisted of conducting interviews with officials of Hajj agencies, who were asked about the role of campaigns and organizations in crowd management. A high-ranking employee of Hajj and Umrah companies and an expert on Hajj campaigns, venues, and services supplied to pilgrims were among the most significant attendees. Using Zoom, each of these interviews was conducted online. In addition, all crowd management-related responses are reviewed and assessed in the findings section.

4. Results and Discussions

The data collection involves two distinct methods: survey questionnaires and interviews with officials from Hajj agencies.

The surveys were conducted separately on pilgrims and Hajj agencies/campaigns, and a detailed analysis of the responses from both groups of respondents was conducted independently. The primary objective was to assess the level of pilgrims' satisfaction with the given services and to assess the difficulties of the Hajj season.

Surveys

Pilgrims Response to Survey Questionnaire: 321 responses was received from the pilgrims' questionnaires composed of nine questions.

The data collected through this survey was divided into three sections: general data about the respondent, Y/N, and agree/disagree questions and respondents' opinions and suggestions.

Section 1: General data

Q1: What is your age?

As shown in Fig. 4, respondents ranged in age from 18 to 50 and older, and the most common group was between the ages of 20 and 29, followed by 40-49 years old with 22.7%.

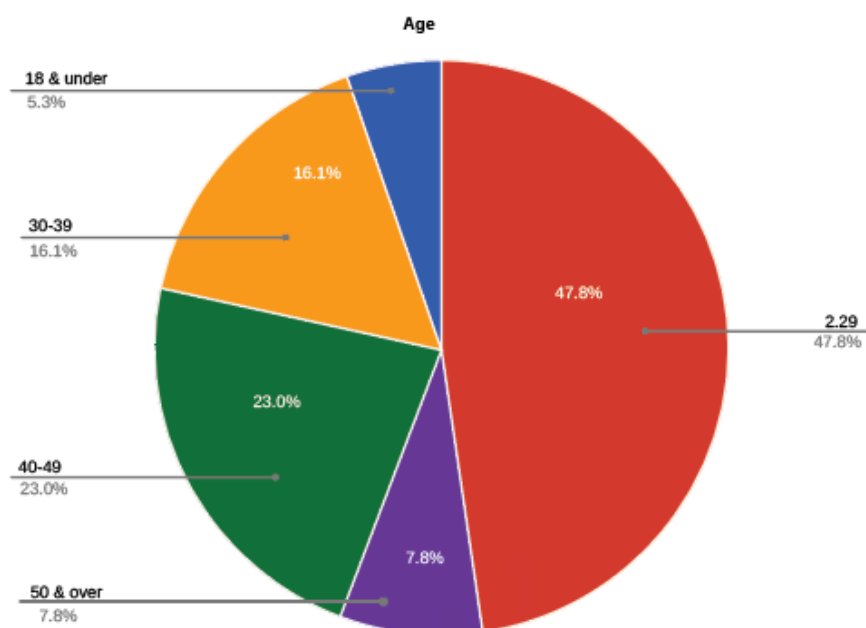


Fig. 4. Pie charts of the Result of Question 1

Q2: Have you ever performed Hajj?

54.2% of respondents have performed Hajj. In contrast,

45.8% hadn't, as shown in Fig.5. This means most of the survey participants have performed Hajj.

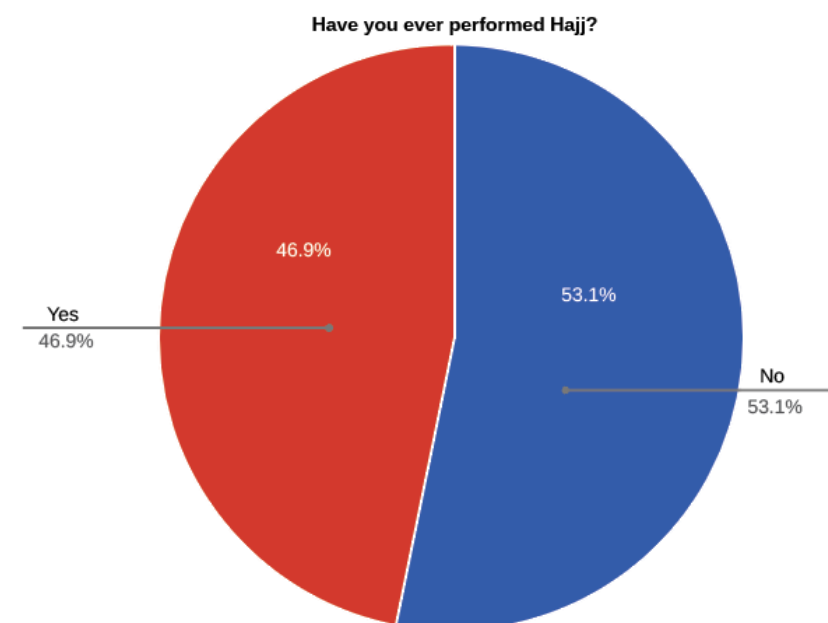


Fig. 5. Pie charts of the Result of Question 2

Section 2: Y/N and agree/disagree questions

Q3: Were the guidelines provided by the campaigns clear to you?

Based on the responses shown in Fig. 6, the guidelines were not clear enough for 68.0% of

people, which means many pilgrims suffered from unclear directives from agencies. At the same time, 32.0% of pilgrims believed that the guidelines were obvious.

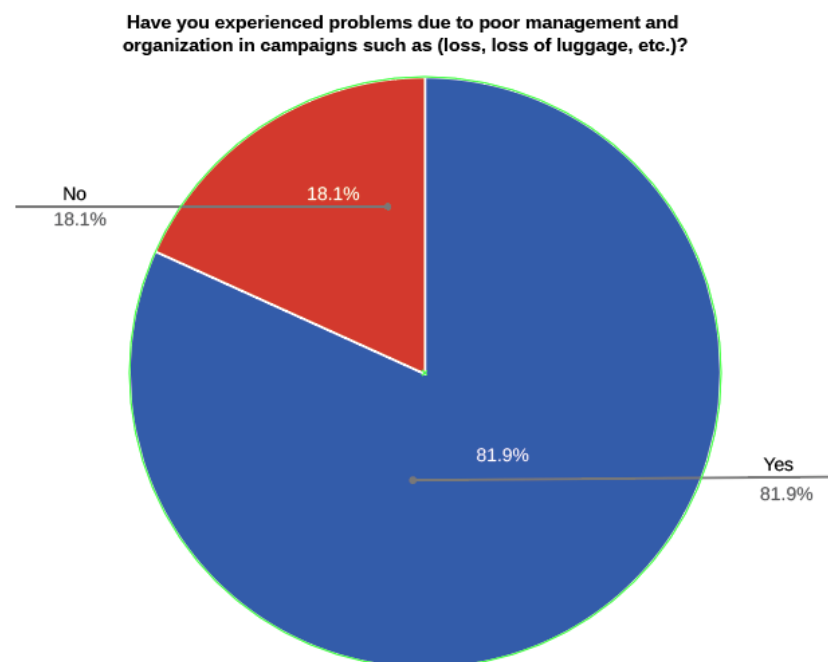


Fig. 6. Pie charts of the Result of Question 3

Q4: Have you experienced problems due to poor management and organization in campaigns such as (loss, loss of luggage, etc.)?

From Fig. 7, the analysis reveals that 81.9% of people experienced problems during the Hajj (such as loss of luggage, etc.). In addition, every one of them is asked to mention the situation they faced. 14%

said, "Transportation is horrible, and you have to rely on yourself, and you have no experience, which causes you big problems," 25% of the answers were "Crowded and disorganized," and 11% answered, "Difficulty communicating with the organizer and the group."

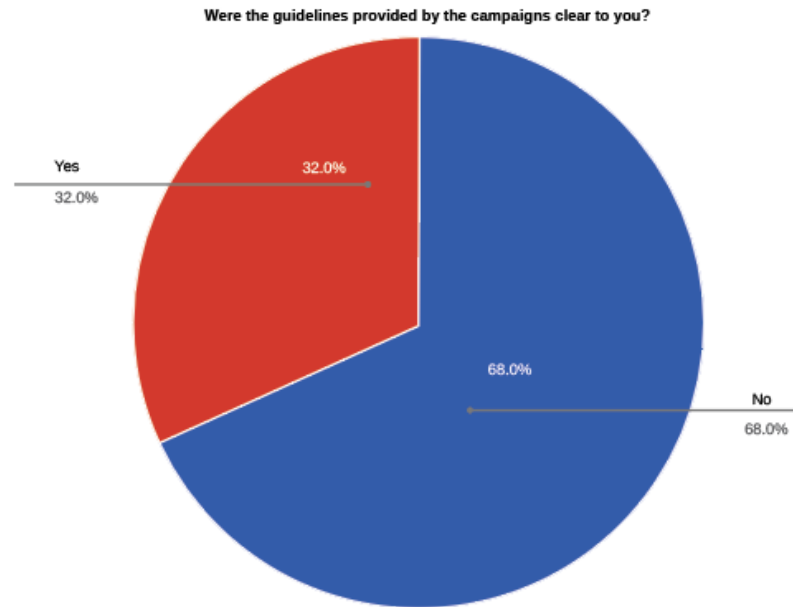


Fig. 7. Pie charts of the Result of Question 4

Q5: Currently, do Hajj campaigns suffer from the poor organization of their pilgrim groups?

Fig. 8 shows that 12.8% strongly disagree and 14.6% disagree that the Hajj tours suffer from the poor

organization of their groups of pilgrims. However, 47.4% agree, and 25.2% strongly agree with Hajj tours' poor organization.

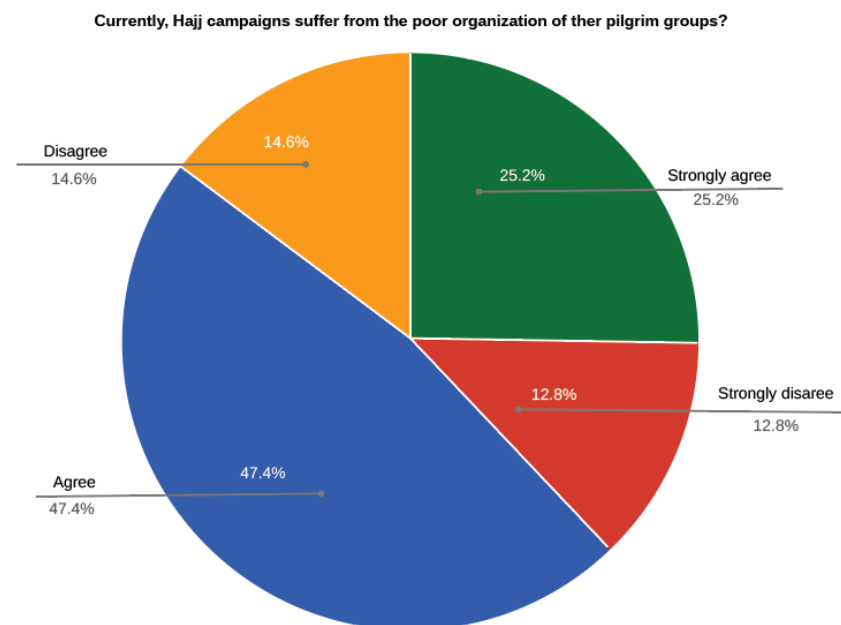


Fig. 8. Pie charts of the Result of Question 5

Q6: Do Hajj organizers use the latest technology and systems to facilitate Hajj?

Fig. 9 observed that 20.2% strongly disagree, and 46.1% disagree that the Hajj tour organizers use the

latest technologies and systems to facilitate the Hajj journey. On the other hand, 29.9% agree, and 3.8% strongly agree.

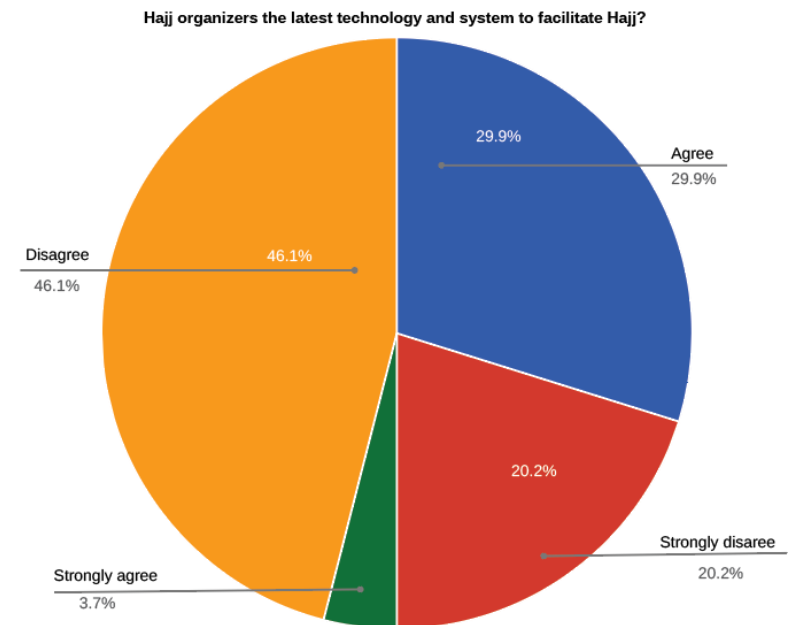


Fig. 9. Pie charts of the Result of Question 6

Q7: Was the communication with the organizers of the Hajj campaigns immediately available and accessible?

From Figure 10, it is clear that 19.3% disagree strongly and 50.8% disagree; more than half of the

respondents considered the communication unavailable and inaccessible. In contrast, approximately 27.1% agree, and 2.8% strongly agree that it was simple to communicate with the organizers.

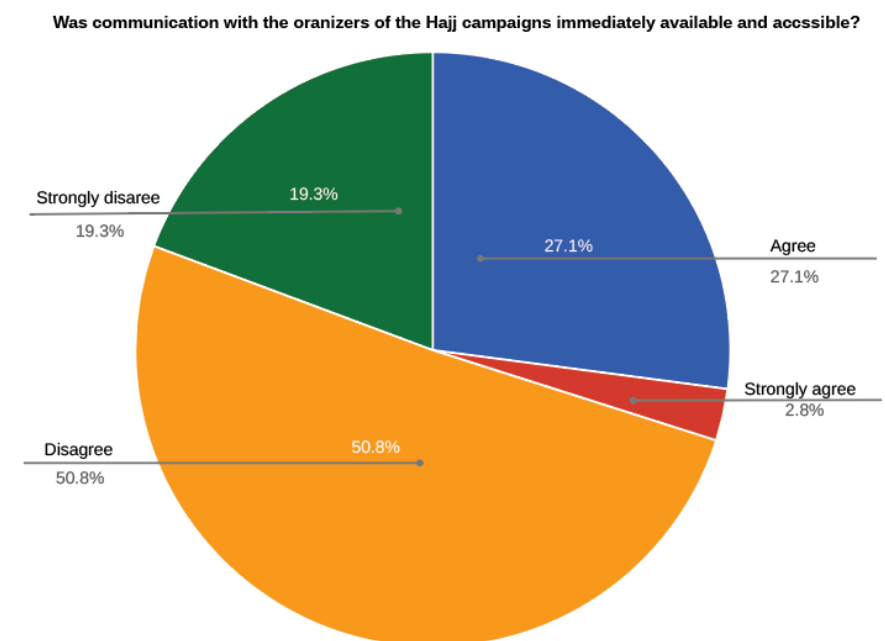


Fig. 10. Pie charts of the Result of Question 7

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Section 3: Respondents' opinions and suggestions

In the eighth question, participants are asked to identify the most significant issues the Hajj has encountered in recent years. Among the responses were the following: Participants cited 'disorganization' 49 times, 'difficulty moving' 30 times, 'lost' 20 times, and 'difficulty connecting with event organizers' 15 times.

Finally, participants were asked what they believe Hajj organizers require to make the pilgrimage easier. Twenty-four respondents suggested developing a mobile application that integrates all the services the pilgrim and the organizer need. In addition, 10% of respondents stated: "They must establish a specific schedule for each group of hajj campaigns." In addition, forty percent of them stated, "They need to organize mass transport, manage the arrangement of pilgrims, and prevent congestion in any form."

Hajj agencies/campaigns Response to Survey Questionnaire: 17 responses from Hajj agencies/campaigns questionnaires were received, composed of seven questions.

The data collected from the survey is classified into two categories: Y/N questions, their opinions, suggestions, and short essay questions.

**Section 1: Y/N questions
Q1: Do you face obstacles in managing and organizing Hajj groups?**

Fig. 11 shows that 70.6% of Hajj and Umrah agencies and companies have issues organizing their pilgrims' groups, whereas 29.4% do not. This analysis concludes that most Hajj organizers face problems managing and organizing groups of pilgrims.

Do you face obstacles in managing and organizing Hajj group?

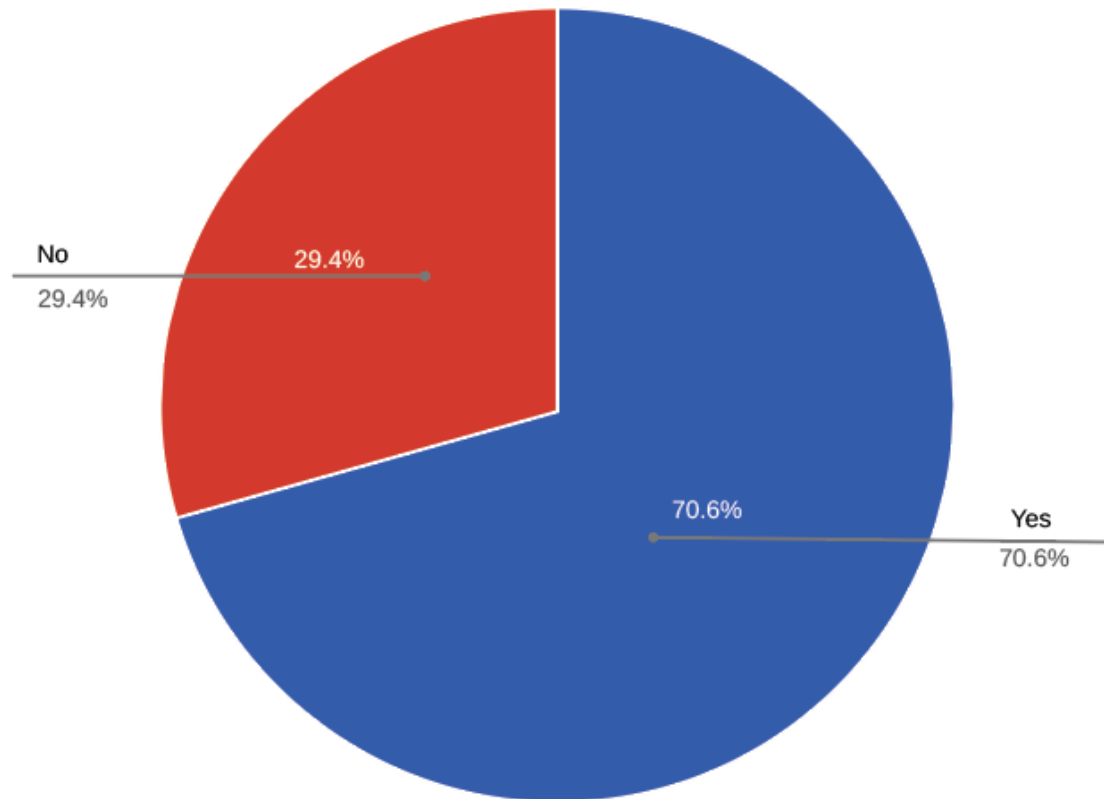


Fig. 11. Pie charts of the Result of Question 1 from Agencies

Q2: Have you ever faced the problem of losing one of your campaign pilgrims?

Based on the responses shown in Fig. 12, 76.5% of

the organizers lost one of their pilgrims. However, 23.5% did not.

Have you faced the problem of losing one your campaign pilgrims?

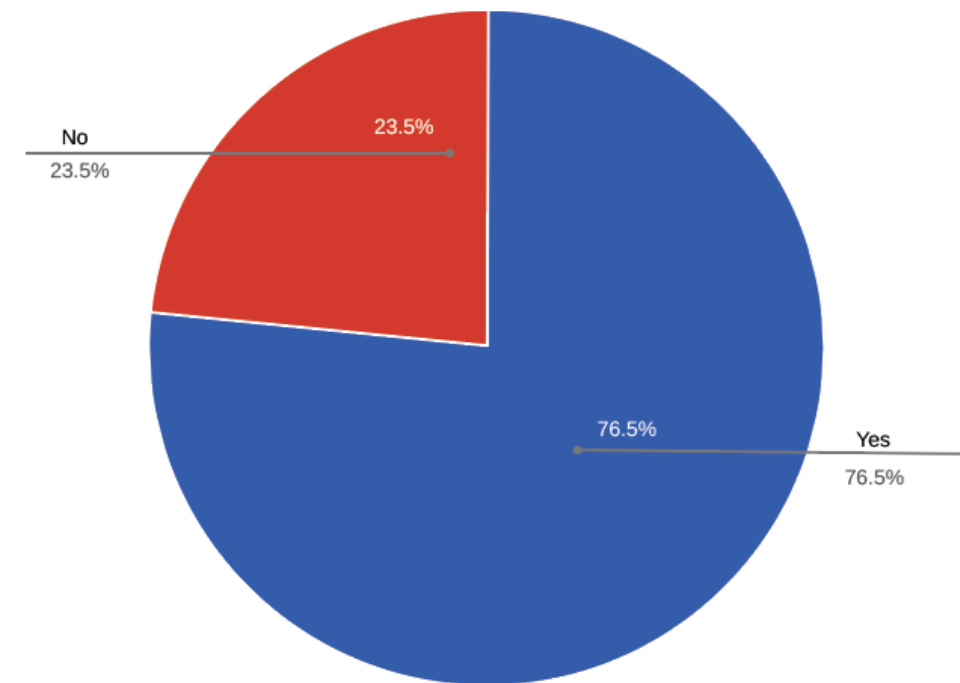


Fig. 12. Pie charts of the Result of Question 2 from Agencies

Q3: Did you have difficulty accessing the pilgrims' information?

Fig. 13 shows that 58.8% of regulators have

difficulty accessing pilgrims' information, while 41.2% do not.

Did you have difficulty accessing pilgrims' informationn?

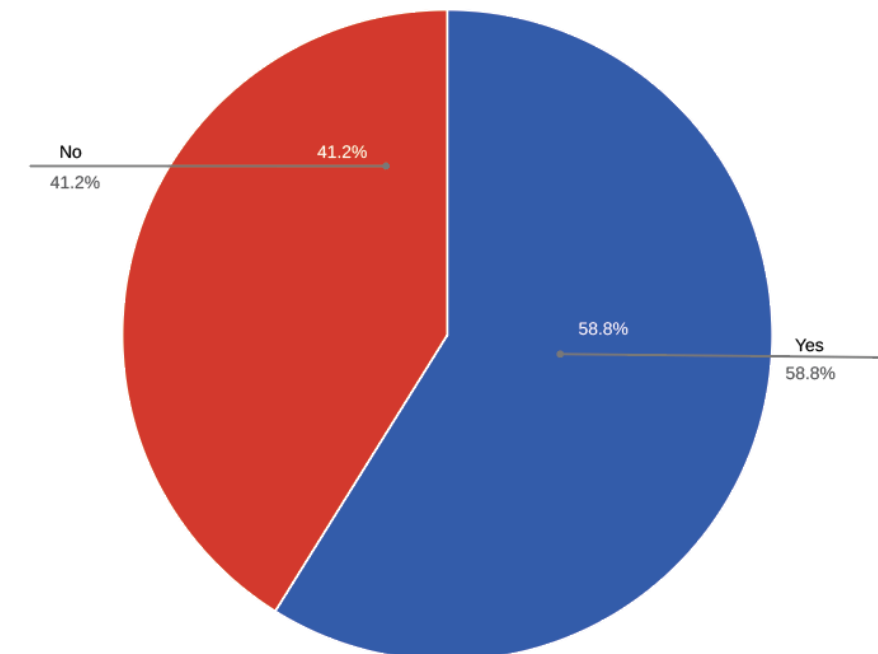


Fig. 13. Pie charts of the Result of Question 3 from Agencies

Section 2: Respondents' opinions and suggestions

The organizers were asked what services or technologies they believed pilgrims needed. 12.9% of respondents thought the mobile application includes all the services intended to be provided to pilgrims. Moreover, 5.9% of respondents responded, "A system to awareness of pilgrims in hajj and its rituals" In addition, 6% of their responded, "A system linked with the National Information Center to text pilgrims on their numbers recorded in the Absher system" In addition, we inquired as to how hotel and transportation bookings are handled throughout the Hajj season. They described a paper system, hotel booking apps, and Hajj agencies. In addition, we inquired about the procedures employed to supply the pilgrim with the campaign trail. According to the responses, there are only two ways to provide the pilgrim with his campaign trail: paper and mobile (Application).

Finally, we asked tour operators what they believe Hajj tours require to make the pilgrims' journey more comfortable. According to the responses, 17.1% responded, "A method of communicating with pilgrims in the event of an emergency or sudden change in plans." Moreover, 35% of respondents mentioned a "Mobile app that meets organizer requirements" In addition, 8% of respondents answered, "Map to find out where pilgrims were when he was lost."

Interviews

The interviews were done with two subject matter specialists. The first was a high-level employee of a corporation specializing in Hajj and Umrah, while the second was an expert in Hajj marketing, sites, and services offered to pilgrims. The discussion focuses on pilgrims and Hajj agencies and how campaign organizers face obstacles during the Hajj season. How do Hajj organizations connect with their pilgrimage groups, and is there a single method for all agencies? is one of the most crucial questions addressed to the first interviewee.

He noted that there is no common method for all Hajj organizations to connect with pilgrims. Each campaign employs a unique communication method, such as WhatsApp or Telegram. Thus, each pilgrim must give internet access and a valid mobile phone number to access flight information and the itinerary; in the event of any updates or changes, the organizer sends a message to the pilgrims. The issue is that no consistent structure links these organizations with their pilgrimage groups. Due to the different communication systems

and the pilgrim's responsibility in the event of loss or crisis, this is regarded as one of the most significant causes of overcrowding-related disasters, as it makes it difficult for some pilgrims to reach the directions and instructions of the organizer, in addition to knowing the places designated for them or the holy places.

During the Hajj season, the loss of contact with some pilgrims, as the only way of communication is the pilgrim's number, and the organizer's reliance on a paper system to prepare and lead pilgrims were cited as the major barriers and challenges facing Hajj agencies. The second interviewee also mentioned a campaign organizer who supervises a group of around 50 pilgrims during each campaign. The organizer must ensure that all pilgrims adhere to the itinerary and continuously oversee and monitor the group. Due to these factors, he believes that one of the primary causes of overcrowding is the incapacity of the organizer to supervise and monitor the number of pilgrims, especially in the absence of a technology system that serves and helps the management of these crowds.

The Hajj is the world's largest gathering of Muslims and one of the most crowded gatherings. This article comprehensively examines the obstacles agencies/campaigns, and pilgrims face during the Hajj season. The analysis is based on the survey responses of pilgrims and Hajj agencies/campaigns and the interviews done to identify the causes of crowd disasters in Hajj. The study concluded, based on the responses of the pilgrims, that 81.9% of the pilgrims experienced problems during the Hajj season, such as crowding and difficulty communicating with the organizer and the group, and that this is due to inadequate regulation of the Hajj tour operators and a lack of technology use. According to the study responses of pilgrims, only 33.7% believe that the latest technologies and systems facilitate the Hajj journey. Yet, the majority disagrees. Because of a lack of technology, 72.6% of pilgrims say that agencies poorly organize Hajj groups.

In addition, a complete review of the organizers' findings revealed that 70.6% of Hajj and Umrah organizations and businesses experienced difficulties coordinating their pilgrim groups due to a lack of technology associated with the organization of pilgrims. The survey reveals that 58.8 percent of Hajj facilities do not employ the most recent technologies that could aid in their management. Consequently, we infer that the difficulty of campaign organizers interacting with

their groups of pilgrims is one of the causes of crowd catastrophes. Moreover, based on the responses of some organizations and campaigns, the organizer communicates with the pilgrim via mobile applications such as WhatsApp or Telegram; therefore, the pilgrim must have a valid cell number and a stable Internet connection throughout their Hajj journey. Consequently, we argue that a unified system incorporating the pilgrim and his campaign must address each problem. Agencies and campaigns must incorporate digital technologies more effectively to ensure the safety and comfort of Hajj pilgrims.

6. Conclusion

Every Muslim aspires to perform Hajj, as it is a central tenet of Islam and an event that attracts the attention of the entire globe. In addition, it is a global conference featuring examples of organizing, monitoring, and filtering millions of Muslims in one location. Each year, Saudi Arabia strives to ensure the safety and order of these masses. In addition, the Kingdom is still on its way to achieving Vision 2030, where it is doing its utmost to receive as many Muslims as possible during the Hajj season, and year after year, with the increase in the number of pilgrims, Saudi Arabia is evolving and raising the quality of service to the highest levels. During the Hajj season, organizers with many foreign and local pilgrims arrive in the Kingdom to oversee and care for them. Normally, tour organizers use paper-based systems to monitor and manage their pilgrims' groups, resulting in numerous issues for both the organizer and the pilgrim. Crowd catastrophes are among the most notorious of these phenomena. According to the findings of this study, 68% of pilgrims did not receive clear and suitable guidance. In addition, 81.9% had issues owing to inadequate management and organization, including the loss of luggage. The primary reason for this is that 58.8 percent of campaigners lack a consistent structure to assist them in organizing large gatherings.

7. Research Implications

This study discusses several critical aspects that could contribute to preventing disasters, such as the stampedes that killed many people (Still, 2019). During the Hajj, our literature study highlighted the most significant crowd management difficulties encountered by pilgrims and provided recommendations for addressing these issues. In conclusion, we suggest that future work in this area could concentrate on developing a uniform digital platform that all Hajj

agencies could use to provide pilgrims with a central solution to monitor and control their movement and communication, thereby alleviating crowd management issues for many years to come.

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