

**SPACE AND COMMUNICATION TOOLS BASED  
APPROACH: Good management and control  
of the Arba'in visit, with joint cooperation and  
remote work using international institutions and  
expertise**

Parviz Tarikhia

Knightbridge University, Denmark

**Iran, [parviz\\_tarikhi@hotmail.com](mailto:parviz_tarikhi@hotmail.com)**

Abdulkareem Abd Ali Mohammadb

College of science , University of Baghdad

**Iraq, [abdulkareem.abdali@gmail.com](mailto:abdulkareem.abdali@gmail.com)**



## Abstract

Ziyarat al-Arba'in is one of the largest annual religious and cultural global events, which involves the presence of a large number of pilgrims from the Middle East in particular, and all around the globe in general. Its importance in terms of appreciating higher human values embodied within this comprehensive revival project, amidst the intellectual challenges that confront humanity in its various dimensions and inclinations is undeniable. In this regard, benefiting of the modern technologies as a strong and effective tool for good management and control of this event can play a vital role. It includes space applications technologies and engineering such as GIS and remote sensing, telecommunications, artificial intelligence, medical sciences and technologies, informatics, mathematics, statistics, and so on.

In this presentation, the authors, who are experienced in space science and technologies, and telecommunications focus on and highlight the effectiveness and importance of these fundamental and infrastructural technologies. Authors believe that the joint work and cooperation of the organizational and independent experts from the relevant entities and sharing knowledge and experience can lead to increment of the synergy of work for good management and control of the event.

Authors, who are from Iraq and Iran, worked for an extended period of time in their relevant national space technology and communication organizations in both managerial and specialized

levels. They share the feasible and accessible potentials and possibilities in both countries for good management and control of the Ziyarat Al-Arba'in event by giving the related examples that are found in both countries and suggest the ways for joining forces by the relevant entities, scientists and experts. In this presentation, authors determine the steps in order of priority and importance, and they believe that the idea of experimenting with collaboration and remote work will certainly yield successful results.

## 1 Introduction

The global and annual religious and cultural march of Ziyarat Al-Arba'in, involves the presence of immense number of mostly Shia Muslim visitors and pilgrims from all around the globe, particularly the Middle East.

The significance of Ziyarat Al-Arba'in lies in its religious, spiritual, and cultural importance, particularly within Shia Islam. Arba'in marks the end of a 40-day mourning period following Ashura, which is the martyrdom anniversary of Imam Hussein ibn Ali (a.s), the grandson of the Prophet Muhammad (pbuh), at the Battle of Karbala. The number 40 holds special significance in Islamic tradition, representing a period of mourning and reflection.

Arba'in is observed by millions, predominantly Shia Muslims, who undertake a pilgrimage to Imam Hussein's (a.s) shrine located in Karbala, Iraq. This pilgrimage is considered a powerful expression of faith, remembrance, unity, and resistance against

oppression. (Bharakda 2023, Wikipedia 2023) It is also a time for communal prayer, recitation of Quran, and performing charitable acts in honor of the deceased Imam and his loyal entourage and relatives. (Bharakda 2023)

The Arba'īn pilgrimage culminates in one of the largest peaceful gatherings in the world, symbolizing the eternal struggle between good and evil, self-sacrifice, and the continuation of Prophet Muhammad's (pbuh) mission (Wikipedia 2023). It is a profound demonstration of devotion and solidarity among the participants, reflecting the deep impact of Imam Hussein's (a.s) sacrifice in the collective memory of the Islamic community (Ali 2023, Shia directory 2023).

For good management and arrangements, we can benefit from modern technologies, especially space technologies and applications, which can act as a strong and effective tool. This includes space applications technologies and engineering such as GIS and remote sensing, telecommunications, artificial intelligence, medical sciences and technologies, informatics, mathematics, statistics, and so on.

Recent advancements in these applications and technologies are applicable and will be referred to in the next sections of this paper. Management of large populations present in an event like that of Ziyarat Al-Arba'īn would therefore benefit greatly from internet and wireless communications networks.

In this paper, we are going to develop a systematic observation

from technical and managerial points of view on the subject expecting to lead to useful and beneficial conclusions, suggestions and recommendations for good management and organization of the event.

## 2. On Ziyarat Al-Arba'in March

The anniversary of the Arba'in is one of the major religious occasions for Shia Muslims. It falls on the twentieth of the month of Safar. Every year, millions of visitors go to Karbala to perform the rituals of visiting the shrine of Imam Hussein bin Ali (a.s).

The total number of pilgrims in the year 2016 AD - 1438 AH was 11,210,367 man, woman and child. The number increased in 2017 AD - 1439 AH, into 13,874,818 pilgrims, while in 2018 AD - 1440 AH, the number has increased again to 15,322,949, followed by another increase in 2019 AD - 1441 AH to more than 15,329,955 pilgrims (KCSR 2020).

In 2023 (Nour News 2023) the number of visitors exceeded 22 million totally from inside and outside Iraq. Millions of pilgrims head to the city of Karbala as participants in huge processions named "Moukeb", in groups or as individuals.

This huge religious event involves walking long distances from the cities of Iraq all the way to Karbala. There are groups that begin their march weeks before the start of the Ziyarat Al-Arba'in from the Ras Al-Bisha area in the Al-Faw Peninsula in the Basra Governorate in southern Iraq to Karbala (Fig. 1), a distance of more than 600

kilometers. Other visitors also walk from the capital, Baghdad, and the cities of Hillah and Kufa towards Karbala. In fact, there are many other routes for the same walk.



**Fig. 1: A map showing the route for visitors during the Arba'ın visit, starting from the Ras al-Bisha area in the Al-Faw Peninsula in the Basra Governorate in southern Iraq to Karbala, and showing the important sites and points on the main southern road. [Source: <https://www.bbc.com/arabic/articles/cj7905k0ke3o>]**

From Iran, where some visitors also travel by foot, the march begins a month before the date of Ziyarat al-Arba'ın. As for visitors arriving from other countries by air, many of them commemorate the anniversary of Arba'ın by walking for two continuous days from Najaf, wherein the shrine of Imam Ali bin Abi Talib (a.s) is located. (Fig. 2)

Arrival of visitors to the holy shrines in Iraq is described as “the largest religious gathering and the largest foot march in the world.”

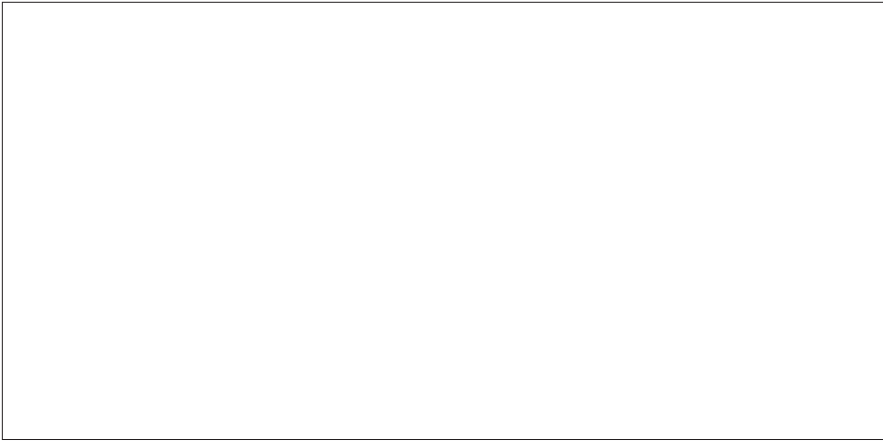


Fig. 2: A map showing the path of visitors on the Arba'ın visit. They commemorate this anniversary by walking for two consecutive days from Najaf, where the shrine of Imam Ali bin Abi Talib (a.s) is located, towards Karbala. On this route, visitors come from Islamic countries by air with many Iraqis from different provinces. They go to Najaf on this march and participate in walking. [Source: <https://www.bbc.com/arabic/articles/cj7905k0ke3o>]

On the Ziyarat Al-Arba'ın anniversary, Iraqis open their houses to visitors. Along the walking routes, residents of the walking route areas of all ages stand, holding food and drinks in their hands, offering them to visitors and inviting them to rest and stay for the night in their homes. (Fig. 3 and Fig. 4)

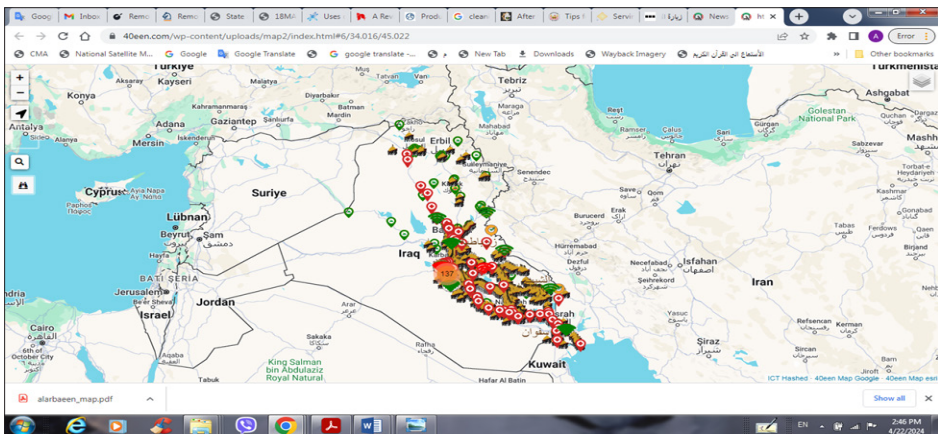
Fig. 3: The wonderful picture shows an Iraqi offering cold water to visitors. Such a scene is frequently seen along the March paths, where residents of the walking path areas of all ages stand to serve the visitors. [Source: <https://en.shafaqna.com/172692/serving-mawkibs-to-Arba'ın-pilgrims-in-iraq-photos/>]

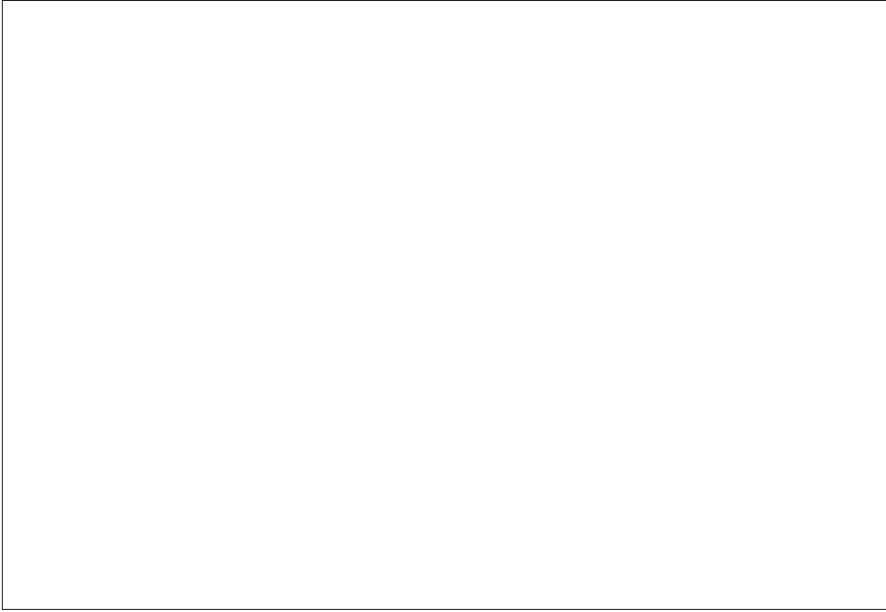


Fig. 4: A picture showing an Iraqi preparing grilled fish for visitors at his home. Such an activity is seen commonly along the walking paths, where residents of the walking path areas of all ages stand up to invite visitors to their homes to eat, or to stay overnight. [Source: <https://en.shafaqna.com/172692/serving-mawkibs-to-Arba'in-pilgrims-in-iraq-photos/>]

These people save their money in order to open a hostel wherein they host visitors, or open their homes for sleeping and feeding. These scenes are unique and has never been observed elsewhere in the world.

Guesthouses, called Hussein Moukebs, are also widespread. These Moukebs are the facilities built by their owners in order to invite visitors, and they provide them with free food and sleeping areas during the visiting period of Ziyarat Al-Arba'in (Fig. 5). Voluntary medical clinics also extend along visitors' routes to help those who may need clinical aids and health care (Fig. 6).





**Fig. 5: A Google map containing the locations of processions (Moukebs) spread along the main and secondary visitors' routes. [Source: <https://40een.com/wp-content/uploads/map2/index.html#745.923/32.343/>]**



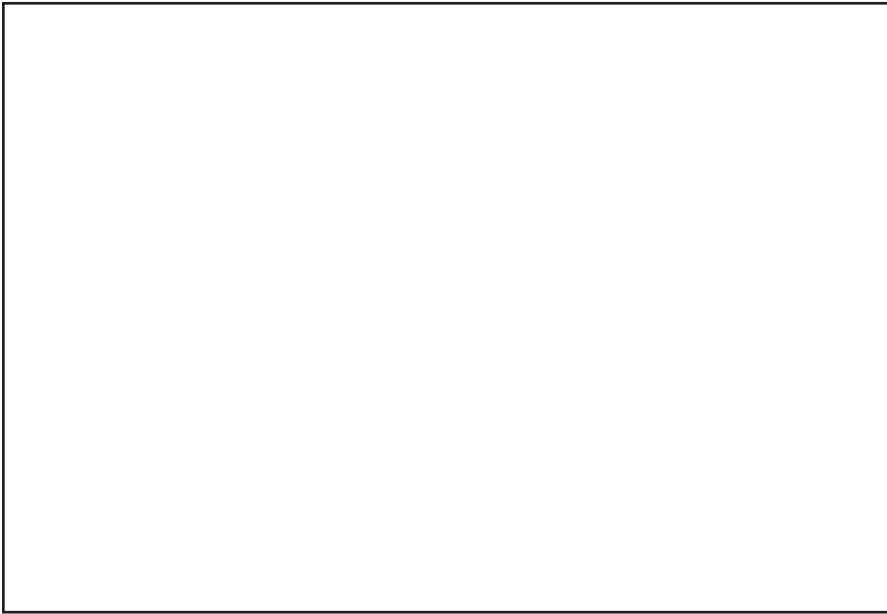
**Fig. 6: Image shows one of the volunteer medical clinics extending along visitor routes to assist those who may need clinical assistance and healthcare. Many volunteer medical clinics extending along visitors' routes offer their services free of charge. [Source: <http://kan-news.com/kan/?p=17549>]**

Along the walking routes, there are widespread funeral gatherings for mourning the incident and tragedies that befell the family of Imam Hussein (a.s). The sounds of the eulogies, which are traditional lamentation poems, are raised and the audience of visitors interact with them. They have developed over the centuries, and special melodies have been added to them, and they now include different styles. A variety of sad chants, differing according to the culture of each country are heard along the path.

Many visitors come through organized campaigns to visit Najaf, Karbala, Kadhimiya, Samarra and other holy places during the Ziyarat Al-Arba'in season. Accommodation operations are organized in Karbala during the visit period for groups and processions in Husseinias, tents, procession houses, hotels, and others.

Visitors are organized into groups called processions "Moukebs" from inside and outside Iraq. The total number of Moukebs were more than ten thousand in 2022 (AlSumaria TV 2022), and more than 28 thousand service processions for the year 2023. (Mawazin News 2023)

These Moukebs walk from their place of residence in Karbala with spatially planned routes and at specific times until they arrive to Imam Hussein's (a.s) shrine and Imam Abbas's (a.s) shrine. The Moukebs start walking in solemn condolence on specific dates. They are organized according to a program prepared by the authority responsible for organizing the registration of processions and managing their walk. Fig. 7 illustrates a map of the visitors' route from their place of residence in Karbala with spatially planned routes. It helps determine their walking times until they reach the shrine of Imam Hussein (a.s) and the shrine of Imam Abbas (a.s).

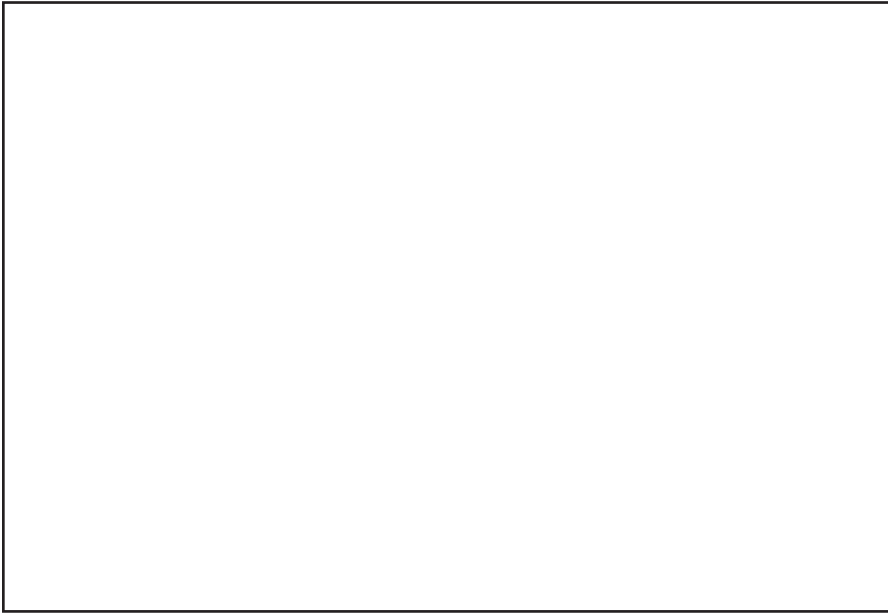


**Fig. 7: A service map for Arba'ın visitors, showing the main and secondary roads of the Holy Karbala Governorate in addition to the sites and important points there. The map determines the route from their place of residence in Karbala with spatially planned routes. [Source: <https://alkafeel.net/news/index?id=13900&lang=ar>]**

Most visitors coming from Iraqi provinces and foreign countries stay for more than 10 days to attend visitation activities and visit other holy shrines in Al-Kadhimiyyah, Samarra, and other places. Great efforts are made to serve visitors from the moment they enter the country and begin the visit ceremony until their departure.

Because of the large number of visitors, especially on peak days, many visitors lose their group. The number of missing people reached 10,726 individuals during the Arba'ın visit in 2023. (fig.

8) The Guidance Centers for the Lost, which are supervised by the Al-Abbas' Holy Shrine, reported 10,726 missing persons, and returned them to their relatives during the Ziyarat al-Arba'in. (ABNA 2022)



**Fig. 8: Due to the large number of visitors, it may cause many visitors to lose their place and their communities. The number of missing persons reached 10,726 individuals during the Arba'in visit in 2023 according to the Centers for Guidance of Missing Persons affiliated with the Abbasid Holy Shrine. Image shows one of the centers for finding missing persons.**  
[Source: <https://en.abna24.com/story/1306490>]

All of this requires logistical operations and support from various levels of society. During this visit, most of the food, drink, and housing are provided free of charge to millions of visitors. In

the holy cities, huge sites are established for cooking food, which are transported and distributed to visitors at various times during the day and night, in addition to processions' specific catering and cooking services.

This great walk is accompanied by the deployment of various security forces on the walking routes and inside the holy cities. Parallel to these walking routes, vehicles along the roads, and railways are available to transport visitors back and forth day and night.

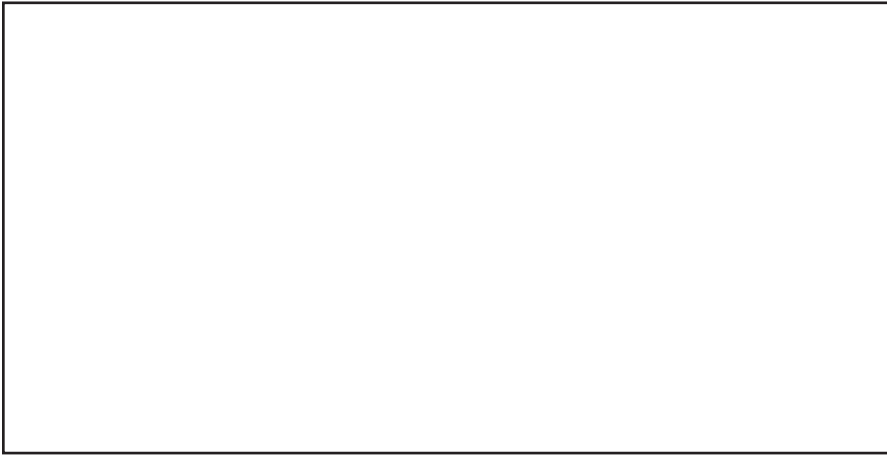
The Arba'in visit is accompanied by extensive cleaning campaigns in all the visitors' walking facilities as well as inside the city of Karbala. Fig. 9 shows one of the workers in the square between the Two Holy Shrines after the end of the visit. (Al Kafeel, 2020)



**Fig. 9: One of the cleaning workers in the square between the Two Holy Mosques cleans after the end of the visit. [Source: <https://en.shafaqna.com/175199/karbala-cleaning-campaign-of-area-between-the-two-holy-shrines-after-ziyarat-Arba'in-photos/> ]**

### 3 Existing and available infrastructure

Technology plays an important role in managing human populations like Ziyarat Al-Arba'in with the presence of the Internet and wireless communications networks. (Fig. 10) The progress of information systems, information communication technology, and data transfer between various computer servers has played a major role in multimedia applications and their diverse uses. Cellular phone networks also played a major role in digital communications systems and became significant basis for various applications and technological systems that have communications channels at the core of their system design. Computers and smart cell phones have also become essential technologies that serve the management of human populations.



**Fig. 10: This photo shows one of the sites where free Internet and communications services are available to serve visitors. [Source: <https://40een.com/en/news-en/internet-service-en/the-expansion-of-the-free-internet-and-communication-network-is-taking-place-throughout-the-entire-holy-province-of-karbala/>]**



Algorithms, smart programs, and artificial intelligence are what have given power to manage the processes of organizing human populations via building platforms supported by applications that serve populations and individual management. Data documentation processes, their uses, and analysis software act as essential tools for such development.

GIS (Geographic Information Systems) and GPS (Global Positioning Systems) technologies have become important tools for assessing and updating the status of applications that serve as important management tools for human populations. The visual data interpretation presented by GIS systems supports different applications.

Telecommunications are dominating our everyday lives. This sector requires a continuous exchange of information that requires time accuracy. GPS has suited this requirement most and has been widely adopted for this specific purpose. Satellite images from various satellites have become the basis for geographic information systems applications.

It provides many applications that serve very important areas in the Ziyarat al-Arba'in in terms of management, monitoring, planning, and even real-time monitoring of weather and climate. It is worth noting that many of the data for these satellites images and their products can be obtained from available international platforms and websites.

In addition, aerospace technologies as drones and balloons have

proven their usefulness in monitoring, imaging, and communications. Drones can be used in providing a variety of aids to people for different purposes.

#### **4. Useful applications and software platforms capable of serving pilgrims**

Important applications can be applied for the Ziyarat al-Arba'in by using modern technology in all its different forms and types and available infrastructure. It mainly includes:

##### **4.1 Electronic applications on smart phones**

An application for sharing religious monologues and supplications for visiting Shrines of Imam Husain (a.s) and al-Abbas (a.s) directly with family and friends.

Using artificial intelligence mapping technology in smartphone applications to obtain information about various walk paths, holy places, and important facilities during visiting events, providing real-time directions and alerts to help the visitor to avoid crowds.

Smart cell phone applications that provide the necessary information and electronic directions to facilitate the movement of visitors and reduce crowding.

An interactive application that arranges sounds that allows the visitor to know and hear his/her location, find his/her destination, and determine the locations of group members if they are dispersed among the crowds. This application can be utilized through the

presence of a GPS system on the smart phone.

Setting up and creating an application to authorize qualified persons to visit the holy shrines with the aim of making it easier for Muslims who are unable to perform the visit of Ziyarat al-Arba'in, including the sick, the elderly, those with limited income, and others.

## 4.2 Robots and smart screens

Using robots and smart screens in some important areas and near holy places can provide services and assistance to the pilgrims. These robots can provide information and instructions and facilitate communication and interaction with visitors in different languages. With technologies based on artificial intelligence, its mission is to disseminate reliable religious guidance, with a touch screen and the ability of multi-language communications.

## 4.3 Specialized platforms and websites

Digital platforms can facilitate the process of registration and obtaining permits. It also aims to facilitate Ziyarat al-Arba'in procedures for reducing the time and effort required to complete procedures from the beginning of the visit until departure.

A platform for the purpose of managing logistics services related to transportation, accommodation, nutrition, health care and security, in addition to analyzing data and identifying places that need to provide additional services or improve infrastructure,

on an ongoing basis and in real time.

Digital application platforms for booking travel tickets and booking hotel accommodation at holy sites.

Platforms for religious guidance and information purposes.

Artificial intelligence and digital platforms that leverage the ingenuity for artificial intelligence like ChatGPT, Gemini, and social media platforms give people the ability to overcome language and geographic barriers and connect with each other seamlessly and easily.

Using technology based on artificial intelligence by taking advantage of the smart identity engine, which can recognize and authenticate identity documents, contributes to speeding up the processing of pilgrims' documents, especially during peak periods.

Providing a smooth and advanced practical technology for pilgrims to the holy shrines with the development of a complete strategic plan in which various electronic services, applications and websites are introduced is essential. These digital platforms contribute to the maintenance, operation and development of electronic systems and services including the configuration of dedicated electronic servers to set up network controls and smooth flow, wired and wireless distribution, and the establishment of modern rooms for data and information centers.

## 4.4 Intelligent transportation

Smart transportation technology that helps facilitate pilgrims' walking within the holy shrine areas is another major issue. Smart transportation is used to facilitate transportation and reduce congestion by specific and recurring schedules. These are provided for different means of transportation.

To facilitate movement and walking of pilgrims between different sites the Global Positioning System Technologies (GPS) and smart applications to track pilgrims' movements is used to direct them to desired locations.

Following up on pilgrim's buses and solving any emergency problems that occur while they are on the move can be done using tracking system by providing and installing tracking devices and its accessories for buses. These devices can read the fuel level, the engine temperature and receive alert orders in case the engine temperature rises to avoid malfunctions. It is also possible to send distress messages to report any emergency that may occur on the bus. All of this can be done through a platform through which we can communicate with the remote tracking devices installed at parties, and the devices send the same signals to the transportation information center to ensure the readiness of buses. This platform contains traffic maps and the status and route of each bus that appears on the map. The possibility of installing cameras inside and outside buses to monitor pilgrims and to ensure their safety and the safety of their belongings, and installing screens to educate

them inside buses.

Internet of Things technology and smart transportation are being used to facilitate movement and guidance for pilgrims, as holy areas are equipped with advanced systems that use Internet of Things technologies.

Monitoring and supporting of intelligent traffic control, using artificial intelligence systems for monitoring and surveillance, and the use of facial recognition technologies to ensure the safety of visitors and monitor human movement flows.

The use of artificial intelligence in the Arba'īn visit is an opportunity to enhance logistics services. Intelligent algorithms and programs manage the processes of organizing human crowds with high efficiency.

Intelligent traffic control is considered one of the modern technologies that contribute to improving traffic flow and avoiding congestion, while pilgrims' movement is controlled using radar devices and control traffic lights.

#### 4.5 Use of smart devices

Using smart devices such as bracelets, smart IDs, and smart watches to read the pilgrims' vital signs, in addition to the possibility of equipping the pilgrims with devices linked to their smartphones. Information such as heart rate, blood pressure and other vital indicators are read and recorded in such smart systems, and this information will be sent to the ambulance and emergency teams

in real time or periodically.

Electronic tracking devices are the main part of tracking system, which are one of the most reliable modern technologies. This system determines the locations of visitors and their routes in various tracking coverage areas using GPS devices. In addition, modern technologies help in tracking emergencies and providing the necessary health care to pilgrims.

#### 4.6 Monitoring and protection intelligent traffic control

Using artificial intelligence systems for monitoring, surveillance and the use of facial recognition technologies ensures the safety of pilgrims and monitor human movement flows. The use of artificial intelligence in Ziyarat al-Arba'in is an opportunity to enhance logistics services.

Intelligent algorithms and programs manage the processes of organizing human crowds with high efficiency. This ensures the safety of millions of pilgrims who flock to the Holy city of Karbala. Real-time data analysis enables a rapid response to any emerging challenges. This ensures a smooth and safe pilgrimage experience for everyone.

Intelligent traffic control is considered one of the modern technologies that contribute to improving traffic flow and avoiding congestion. The movement of visitors can be controlled through the use of radar devices and control traffic lights.

## 5 .Technologies that can serve Ziyarat Al-Arba'in

According to what was stated above, the most important techniques during the Arba'in visit season can be listed below:

1. Electronic payment technologies that can be used to facilitate the payment process and financial transfers related to pilgrims.
2. Biometric technologies such as facial recognition and fingerprints, which are used to verify the identity of pilgrims, and facilitate the process of entry and exit from various sites.
3. Logistics and navigation technologies such as GPS and electronic mapping technologies, which can be used to help pilgrims to identify different locations and routes and direct them.
4. Communication technologies such as smart applications and wireless communication technologies, which are used to provide information, communicate with pilgrims, and guide them.
5. Medical technologies such as health monitoring technologies and rapid laboratory analysis, which are used to maintain the safety of visitors and prevent diseases and epidemics.
6. Artificial intelligence techniques that can be used to analyze data and information related to the visit, and provide the necessary instructions and recommendations to improve the performance of Arba'in March.
7. Audio and lighting technologies, which can be used to provide audio instructions and appropriate lighting for pilgrims at the holy shrines and other locations where crowds of pilgrims travel.
8. Robotic technologies that can be used to provide services and assistance to pilgrims in various locations for providing to them water, food, medicines, and assistance with transportation.



9. Environmental technologies that can be used to provide appropriate environmental services to pilgrims for providing hygiene, sanitation, and waste management

## 6. Significant technological systems for Ziyarat Al-Arba'in services

Ziyarat al-Arba'in march is one of the largest annual peaceful gatherings in the world, and has seen the integration of various technologies to enhance the experience and safety of the pilgrims. Some ways that the technology is playing a role are given here:

### 6.1 Virtual Reality (VR) Experiences

Initiatives like VR Karbala allow users to immerse themselves in the historical events of Karbala through realistic animations and sound, providing a unique educational and spiritual experience. (Shah 2019)

### 6.2 Ride-Hailing Services

To facilitate travel in Iraq, especially in cities like Karbala and Najaf, ride-hailing apps offer services in multiple languages, ensuring safety, security, and convenience for pilgrims. (Shah 2019)

### 6.3 Cyber Ziyarat

For those unable to attend in person, cyber Ziyarat has become a popular way to engage with the event remotely through video calls, sharing pictures, and voice notes. (Shah, 2019)

## 6.4 Soft Power and Diplomacy

The Arba'īn March also plays a role in soft power strategy performance in Iraq, fostering social ties and cooperation between Iraq and countries like Iran, as well as with Iraqi Shia groups to manage the March. (Masoudi & Nourian 2023)

These technological advancements not only help manage the logistics of such a massive event but also enhance the spiritual and cultural experience for the participants. Exploring how these technologies are developed and implemented, their impact on the pilgrimage experience, and their broader implications for international relations and cultural exchange is needed to be studied in details while it is out of scope of this paper.

In all, a list of technologies used during the Arba'īn march is as follows:

1. Communication Networks- To manage the massive influx of pilgrims, Iraq enhances its mobile and internet infrastructure to ensure connectivity for safety and coordination. (Ingram 2020)
2. Health and Safety- Medical stations equipped with modern technology provide healthcare services to the pilgrims. Drones may also be used for aerial surveillance to monitor crowd movement and manage emergencies. (Ingram 2020)
3. Logistics and Accommodation- Advanced logistics systems are in place to manage the distribution of food and water, as well as to organize accommodation for millions of pilgrims. (Ingram 2020)

4. Transportation- Special transportation systems, including buses and trains, are often arranged to transport pilgrims to and from various points during the Arba'īn March. (Ingram 2020)

5. Security- Security forces use surveillance cameras and other security technologies to ensure the safety of the pilgrims throughout the event. (MEE 2022)

6. Environmental Management- Waste management technologies are employed to handle the large amounts of waste generated during the march, ensuring environmental sustainability. (Ingram 2020)

The above-mentioned technologies play a focal role to ensure that Arba'īn march is conducted smoothly and safely, accommodating the needs of the immense number of pilgrims yearly.

Moreover, during the Arba'īn march, a variety of technologies are utilized to manage the massive influx of pilgrims and ensure their safety and well-being. Some examples are as follows:

- Communication Networks: To handle the communication needs of millions of pilgrims, temporary mobile towers and additional Wi-Fi hotspots are often deployed to enhance connectivity.
- Medical Services: Mobile medical units and telemedicine services are provided to offer healthcare to pilgrims along the routes.
- Transportation: Buses, cars, and other vehicles are often organized in a fleet to transport pilgrims over long distances. GPS tracking is used to manage the flow and ensure safety.
- Food Distribution: Automated systems and supply chain technologies

are employed to distribute food and water to the pilgrims efficiently.

- Security: Surveillance drones and CCTV cameras are used for crowd monitoring and control, ensuring a safe environment for the pilgrims.

These technologies contribute to the harmonious organization of the march, despite the challenges posed by the large number of pilgrims. Additionally, the Arba'īn March has been noted for its spontaneous organization, where everything from food to medical care is provided free of charge, with local warehouses transformed into big kitchens to feed all pilgrims. (Ingram 2020)

The March also has significant cultural and social impacts, strengthening social convergence and cooperation among participating groups, which is an important aspect of the March's management. (Masoudi & Nourian 2023)

## 7 Security systems for secure management of Ziyarat Al-Arba'īn

Security is of great importance for Ziyarat Al-Arba'īn and must be considered with the utmost care.

Presence of dissidents reached the point where a suicide bomber killed a large number of visitors gathered in areas where pilgrims were walking and travelling by foot to Karbala. An example of this is what happened in 2010 and 2012. A suicide bomber killed at least forty-four Arba'īn pilgrims and wounded some seventy (VOA News 2010), near Nasiriyah.

Therefore, the visit is performed under tight security, guarded by tens of thousands of Iraqi forces and volunteers in various places along the distances traveled by the visitors.

Consequently, the security of large crowds of visitors requires security awareness among all visitors through instructions and directions for all visitors from inside and outside the country. Security monitoring in all its forms so that it leads to the discovering sabotage plans before they happen. Security plans must also be tight and flexible enough to surround and deal with any terror and sabotage situation when it occurs.

## **8 Intelligent managements and monitoring of Ziyarat al-Arba'in for support and emergency purposes**

Managing large crowds in Ziyarat al-Arba'in and organizing them in a safe and effective manner requires planning, coordination, organization, and control of the movement and behavior of individuals, as visitors participate in many social, economic, cultural, and religious activities. Presence of the large number of visitors may cause painful incidents such as suffocation, stampedes, injuries, and deaths. Therefore, crowd management includes planning advance to reduce these risks.

Performing effective and efficient management requires the following:

- Defining the goals of managing visitor crowds by determining what is needed to achieve in the itinerary and organization. Then

direct efforts to serve these goals.

- Careful planning to organize crowds of visitors and direct them towards specific goals. This includes choosing the appropriate location and preparing the necessary equipment and tools to effectively organize the itinerary and accommodation of pilgrims.

- Implementing the plans that have been developed and controlling visitors' path movements and behavior in a safe and effective manner.

- Pilgrim management requires good communication with Moukeb management and understanding their needs and aspirations. Then, interacting with them in such a way that suits the surrounding circumstances and requirements.

- Crises and accidents pose a risk to the safety of pilgrims and staff responsible for their management. There must be plans for crisis and incident management, with quick and effective actions to be taken in emergency situations.

To achieve intelligent management and control in the Arba'īn march and to serve visitors, we require expanding the use of modern technologies in the areas of developing decision-making processes and governance in procedures and services through the design of electronic platforms and applications for the purposes of support in normal circumstances, emergency situations, and risk management. The intelligent management of the Arba'īn visit uses complete technology and a safe process, and includes the pre-arrival stage

for visitors, then arrival and departure, transportation, providing health and safety, accommodation for visitors, and performing the visitation ceremonies in the best possible way.

All of this requires management and operation services for information technology (IT) systems, which includes managing technological services provided by integrated smart information technologies, and requires deep experience, a distinctive approach to implementing or developing technologies, and advanced software tools and processes. This is done by implementing a strategy to achieve management requirements and logistical support challenges.

IT services serve the following basic areas in accordance with the set objectives, which are infrastructure management, information and data security management, network management, technical support management, monitoring management and application management. Thus great benefits are achieved in the work and include overcoming infrastructure challenges, daily reduction of IT risks, enhance IT security, predict costs, enjoy high-quality performance, enhance IT service availability, improve operational efficiency, enhance IT service operations and management and finally advance business growth.

An example of this is making an emergency plan for the Arba'in pilgrimage of Imam Hussein (a.s), within the health aspect, to confront communicable diseases in general. This is done by distributing immediate ambulance vehicles near emergency centers and rapid response teams, in order to deal with critical emergency cases, and medical detachments within the city of Karbala and external roads,

all of which are connected to the digital communications network and linked to field hospitals and city hospitals for the purposes of electronic management and rapid response. Working on preventive and curative measures during the Arba'īn visit, the necessity of conducting swabs and analysis of visitors at the entrances to roads and visitors to emergency centers and health centers is essential, as well as investing in the visit to conduct vaccinations at vaccination outlets to vaccinate citizens with anti-viral vaccines, as well as working to raise awareness and educate visitors about the dangers of epidemics and how to prevent them.

## 9 What would be beneficial to be carried-out

The fundamental commitments, which are suggested in the following lines, could be beneficial and useful in fulfilling good performance of Ziyarat al-Arba'īn. Considering the actions listed below solicits using modern technologies among which the air and space applications can play basic roles in:

1. Establishing a Specialized Council for decision making and setting up the basics of future planning and developing of useful applicable ideas, with the aim for sustainable planning to develop processes for enduring success of Ziyarat al-Arba'īn.
2. Establishing and organizing a Steering Committee to implement and control the decisions made by Specialized Council.
3. Launching a focal web-site along with associate social media sites and blogs for exchanging and sharing ideas, news, knowledge, experiences, and conducting education and training for interested visiting scholars,



specialists, and public knowledge seekers.

4. Smart data archiving for study and analysis purposes in conjunction or independent of the above-mentioned web site.

5. Developing plans to attract individuals and institutions into voluntary work to prepare applications for cell phones serving Ziyarat Al-Arba'in

6. Developing plans to attract mobile phone companies to support the systems that serve Ziyarat al-Arba'in.

7. Developing a plan to invite large companies to submit proposals to serve Ziyarat al-Arba'in.

8. Intelligent media management to follow up Ziyarat Al-Arba'in visit

9. Smart management of the entire Ziyarat Al-Arba'in march and events between different levels of officials

## 10 Improving the quality of Arba'in March

Some different techniques can be applied during the Arba'in march to improve several aspects, including:

### 1- Improving security and safety

Modern technologies can be used during March to improve security and safety, such as:

- Facial recognition technologies.
- Explosives and weapons detection techniques

### 2- Facilitating visiting procedures

Various technologies can be used during the march to facilitate procedures, such as:

- Electronic payment technologies.
- Biometric recognition techniques.

### 3- Providing information and guidance

Modern technologies are used in the march to provide information and guidance to pilgrims, such as:

- Smart mobile applications.
- Lighting and sound devices.

### 4- Improving services

Various technologies can be used in the march to improve the services provided to pilgrims, such as:

- Robotics technologies.
- Artificial intelligence.
- Logistics techniques.

### 5- Providing a healthy and clean environment

Various technologies are used in the march to provide a healthy and clean environment for pilgrims, such as:

- Sanitation techniques.
- Trash management.

### 6- Providing transportation

Different technologies can be used in the march to provide, manage and improve different means of transportation, such as:

- Buses.
- Trains.
- Planes.

#### 7- Improving health care

Various technologies are used in the march to improve the health care provided to pilgrims, such as:

- Health monitoring techniques.
- Rapid laboratory analysis.
- Field hospitals.

#### 8- Improve accommodation

Various technologies can be used in the march to improve the accommodation for pilgrims, such as:

- Providing air-conditioned tents.
- Squares
- Locations of processions and definition of their services
- Health facilities.
- Cleanliness.
- Cooling.

#### 9- Facilitating communication methods

Various technologies are used during the march to facilitate the process of social communication between pilgrims. Therefore,

smart mobile applications and social media can be used.

## 11 Suggestions and Conclusions

In this paper, we tried to point out and explain the technologies that are being applied or could be applied for managing and organizing the Arba'in march. These technologies are supported by mainly air and space, and communication technologies infrastructure or indirectly related to this afore mentioned technologies. However, there are some of the technological advances that would allow the authorities to welcome back tens of millions of pilgrims for Ziyarat al-Arba'in. It includes, booking slots on an app to perform a 1,400-year-old religious rite; smart health technology to check on the frail and infirm; and holographic doctors 700 kilometers away to diagnose them remotely. (Nihal & Al Shaibany 2022)

Using apps like the Smart Pilgrim would make it more convenient for pilgrims to make bookings internationally. They will be able to adopt new and advanced tools that help them arrange all aspects of their trip.

At the international airport arrivals, the state-of-the-art technology could allow for doctors kilometers away in the center, to diagnose the incoming patients and ill people via a hologram. Health authorities can also provide round-the-clock medical assistance through toll-free numbers using relevant apps.

The lounge complex at specific sites at the area could be equipped with state-of the-art health centers, with three 24-hour

Red Crescent ambulance teams. These health centers can handle numerous pilgrims daily. The treatment could range from simple check-ups to dentistry and life-saving heart surgery for instance. Moreover, high-tech mobile clinics can offer services to the pilgrims.

Even before the pilgrimage starts, a team of robots can be managed to sanitize the holy sites as part of pandemic-control measures to protect worshippers from bacterial and viral threats. Each robot carrying a container of sanitizer can be programmed to work for designated hours without human intervention.

Groups of scholars can be assigned to answer pilgrims' queries during the Arba'in March and interactive robots with touchscreens can be stationed at the main entrances of the shrines or outdoor areas where the ceremony takes place to help in providing needed information and guidance.

To help the elderly and people with disabilities, electric vehicles could be stationed and be made available to provide service if needed. Electronic umbrellas could be in operation to protect people from the sun and robots dispense bottles of water or other refreshments. Massive water coolers and sprinkler systems can be installed in convenient locations to help cool pilgrims, reduce heat and refresh the air.

The ICT infrastructure entities can provide services using interlinked towers to enable telecom operator clients to serve the pilgrims. This can provide faster connection between travelling pilgrims and their families back home

Holding an exhibition for international companies to present their products in the field of developing services for visitors and processions will encourage many international companies to display their products and capabilities, especially if they become aware of the role of governorates and Moukebs in the Arba'ın visit. Creating a platform to advertise this exhibition and the possibility of displaying it through the platform will help a huge number of companies participate and display their products on the platform.

Announcing the need for computer applications and smart phone applications is another major issue. After defining the application requirements, many talented people will come forward in preparing different applications that serve visitors of Arba'ın march, especially if an award for strong and qualified applications is announced.

The necessity of creating a package of names for master's and doctoral projects in scientific and engineering universities to build and develop systems that serve the march and invest and participate in scientific minds in developing services at the Arba'ın visit.

## Acknowledgements

Authors extend their sincere appreciations to the conference authorities to provide them with the opportunity to contribute to the conference to promote technical aspects that are feasibly applicable for the Arba'ın march.

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