



# Waleef

Your Driving Companion for a Safer  
and Smarter Drive



**Waleef was brought to life by a team of Computer Engineering students at Qatar University:**

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In a world increasingly driven by technology, artificial intelligence (AI) and automation, the integration of intelligent systems into vehicles offers significant potential for improving safety and convenience. Waleef, developed by a research team at Qatar University, emerges as an innovation aimed at enhancing the driving experience and reducing distractions faced by drivers. The system assists both drivers and passengers by autonomously handling simple yet essential tasks while driving, such as retrieving objects or handling beverages, allowing the driver to focus on the road and enhancing the passenger's experience.

### Project Motivation and Conceptualization

Waleef was conceptualized in response to a real-life scenario encountered by team member Razan Abdelgalil. During her commute from university, she needed to retrieve her medication stored in a bag placed on the backseat. Attempting to reach for the item while driving introduced a significant safety hazard, which sparked the question: *What if there was a way to access items in the car without endangering the driver?*

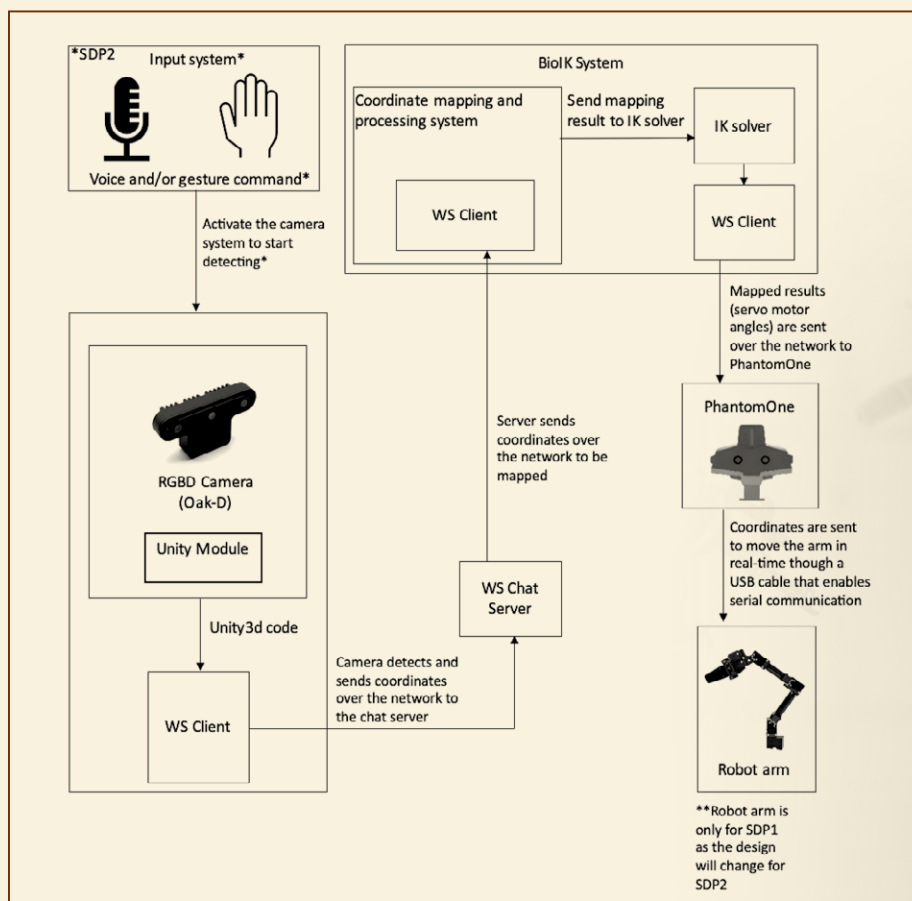
This question became the foundation for Waleef, an in-vehicle robotic assistant designed to enhance safety and convenience. Waleef retrieves objects, handles beverages, and even provides companionship during long drives. By automating these tasks from the driver and mitigating cognitive and physical distractions, it contributes to a safer, more focused driving experience.

### How Waleef Works

Waleef is a compact robotic system integrated into your vehicle. It consists of three main components: (Figure 1)

- 1. Robotic Arm:** A lightweight, multi-jointed arm that can reach and retrieve items from different parts of the car.
- 2. Depth Camera:** An AI-powered camera that detects and locates objects within the vehicle.
- 3. Voice Command Interface:** Drivers can interact with Waleef using simple voice commands, making the experience hands-free and seamless.

Example Use Case: When a user issues a command such as, "Waleef, grab my water bottle,"



**Figure 1:** High-level architecture of Waleef system.

the system utilizes its depth camera to locate the target object, triggers the robotic arm to retrieve it, and delivers it to the user, all while ensuring that the driver remains visually and cognitively engaged with the road.

### Waleef in Action

Waleef is an intuitive companion robotic appendage designed to enhance interactions during daily commutes for both drivers and passengers (Figure 2).

### Why Waleef Matters

**Safety Enhancement:** By minimizing distractions, Waleef helps drivers stay focused, potentially reducing accidents caused by reaching for objects or handling beverages while driving.

**User Convenience:** The system automates frequent and repetitive in-vehicle tasks, such as retrieving items or holding beverages, thereby enhancing comfort and reducing task-related stress.

**Technological Enhancement:** Waleef represents a step towards the integration of smarter and more interactive vehicles that prioritize both safety and user experience. Setting a precedent for the development of human-centered automotive technologies.

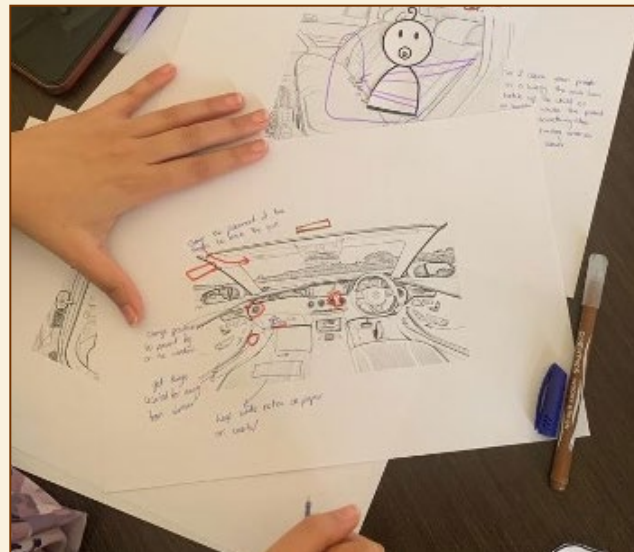
### What Users are Saying

The research team conducted two types of

requirement analysis and testing to validate whether Waleef meets user needs and ensure its usability and relevance.

### 1. Focus Group

This research method involves a group of four to five participants who engage in discussions and provide feedback on a specific topic. The team conducted four different focus groups at Qatar University. The number of use cases extracted from the focus groups was 295, ranging from simple physical manipulation tasks to complicated AI-driven tasks.



Focus group

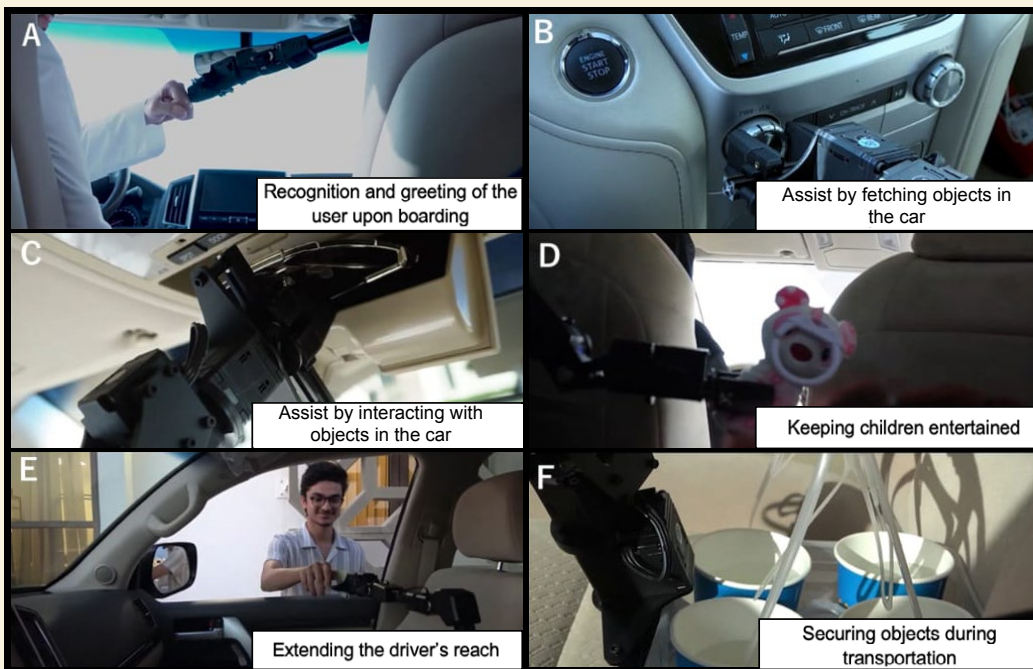


Figure 2: Daily Interactions with Waleef.

## 2. User Study

This research method involves observing and analyzing the targeted audience to understand their behavior, preferences, and opinions. The team conducted twelve different user studies at Qatar University. Participants evaluated Waleef's performance and contribution to a safer driving experience.

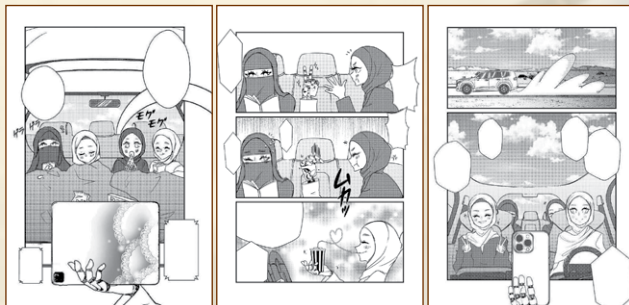


User study

The results and analysis for both evaluation methods demonstrated strong user satisfaction. Participants in the user study expressed satisfaction with the interaction and emphasized the system's effectiveness in minimizing distractions, noting that the system is easy to use and provides a safer driving experience.

### The Future of Waleef

Due to the novelty of this project, the team created an illustration (Manga) to showcase their future life with Waleef, which was professionally illustrated by digital designer Ms. Noora Al-Subaey. The Manga envisions daily life with Waleef, portraying three main stories of how Waleef can interact with users, integrating within daily routines, supporting in-vehicle interactions, and creating new experiences. Figure 3 presents one of the stories.



**Figure 3:** From left to right: manga pages 1, 2, and 3.

In the leftmost figure, a group of friends leaves for a journey, and Waleef snaps a selfie of the group before the excursion. The center figure shows Waleef engaging in a game of rock-paper-scissors with the passengers and entertaining them while on the way. Waleef also helps the driver by passing her a drink and assisting her in drinking so she can focus on the road. Lastly, in the rightmost figure, as friends reach their destination, Waleef grabs the tablet and plays their favorite show while they have snacks. The goal is to make Waleef an indispensable part of every vehicle, ensuring safer and more enjoyable journeys for everyone.

### Conclusion

Waleef is more than just a robotic arm—it's a modern solution to the problem many drivers and passengers face daily. By addressing the challenges of distracted driving and enhancing in-vehicle convenience, Waleef paves the way for a future where technology and safety go hand in hand. So, the next time you're on the road, imagine having a helpful companion like Waleef by your side, making every drive smoother and safer.

