# THE POTENTIAL FOR AUGMENTED REALITY IN SALES, ELEVATOR INSTALLATION & OPERATION

Keshav. J, Mohammed Rizwan M and M Mohamed Shameer

**KEYWORDS:** Augmented Reality, Bridging Digital, Physical Realms and Elevator Installation

## ABSTRACT:

Augmented Reality (AR) is rapidly gaining traction as a versatile tool across diverse industries, revolutionizing sales, elevator installation, and operational processes with creative solutions. In the realm of sales, AR transforms customer experiences by overlaying digital information onto the real world, creating interactive and immersive experiences. This capability allows consumers to visualize products within their actual environments, thereby enhancing engagement and comprehension. As a result, businesses could witness increased conversion rates and customer satisfaction, as AR provides a deeper understanding and connection to the products offered.

In elevator installation, AR could play an important role to technicians and engineers. By overlaying detailed schematics and instructions onto physical components, AR may facilitate more precise and efficient installation procedures. This technology could reduce errors and shorten installation times and bolster safety by delivering real-time guidance feedback and professionals to navigate complex installations with greater confidence and accuracy.

Furthermore, AR may help in elevator operation and maintenance by offering intuitive visualizations of intricate systems. Operators and maintenance personnel can swiftly identify and address potential issues using AR, ensuring smooth and reliable performance. This proactive approach to troubleshooting and maintenance has the potential to help prevent disruptions and extend the lifespan of elevator systems.

The integration of AR into many industries could streamline processes and enhance user experiences support businesses to meet contemporary demands with pioneering solutions. By bridging the digital and physical realms, AR is poised to redefine how industries tackle sales, installation, and operational challenges, fostering a future where technology seamlessly enhances everyday experiences.

# 1. INTRODUCTION

Augmented Reality (AR) is a computational technology that facilitates the real-time overlay of digital information such as 3D models, data visualizations, and interactive elements onto live video feeds of the physical environment. Building upon foundational techniques from Virtual Reality (VR), AR systems leverage advancements in **computer vision**, **sensor fusion**, and **spatial mapping** to enable dynamic interaction between virtual constructs and real-world contexts


*Image source: https://www.exalogic.co/insights/envisioning-technology-platform-of-the-digital-era-for-your-business-needs*

Let us explore the applicability of AR within the elevator domain, focusing on its potential to support sales operation, streamline maintenance workflows, enhance technician training, and improve operational diagnostics through immersive and context-aware interfaces.

**To explore the AR technology in below functions:**

**In Sales** | **In Installation** | **In Operation & Maintenance**

*Figure: Examples on Augmented Reality Visuals*

*Image source: 1.Sales 2. Installation 3. Operation & Maintenance*

## 2. Current Challenges in Elevator Sales, Installation, and Operation

Sales:

- Difficulty in showcasing elevator models as per customer need in real-world situations.
- Limited customer engagement due to static brochures or 2D visuals.
- Customization options are hard to visualize for clients.

Installation:

- Even experienced technicians may need to refer to manuals and prior experience.
- Lack of real-time guidance during complex installations.
- Troubleshooting is time-consuming and may require expert visits.

Operation:

- Where there is no connected monitoring solution maintenance schedules are reactive rather than predictive.
- Diagnosing issues requires physical inspection, leading to downtime.
- Ensuring compliance and safety checks is a manual process.

## 3. Transition to (Augmented Reality) AR Technologies:

Addressing the challenges above, let us explore how Augmented Reality (AR) could enhances elevator sales, installation, and operations by enabling spatial visualization, real-time procedural support, and data-driven maintenance with the potential to improve decision-making, reduce errors, and enable predictive services.

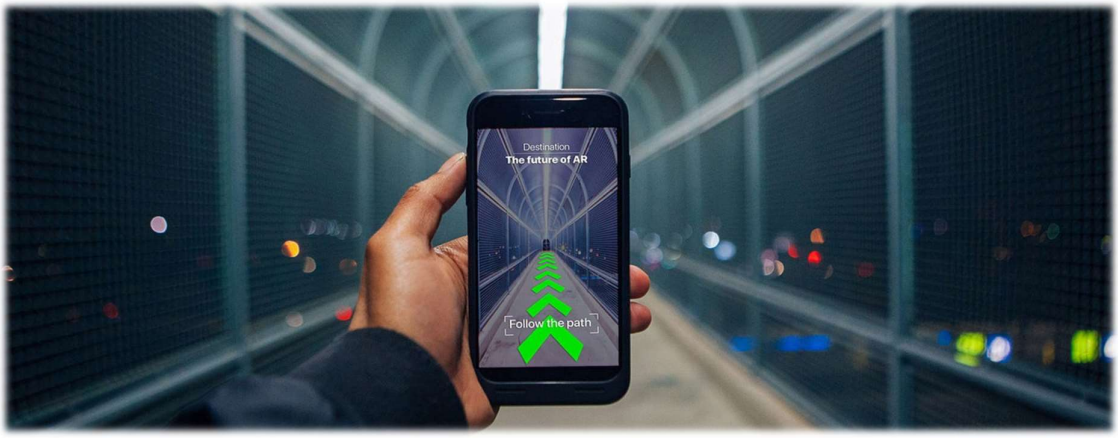
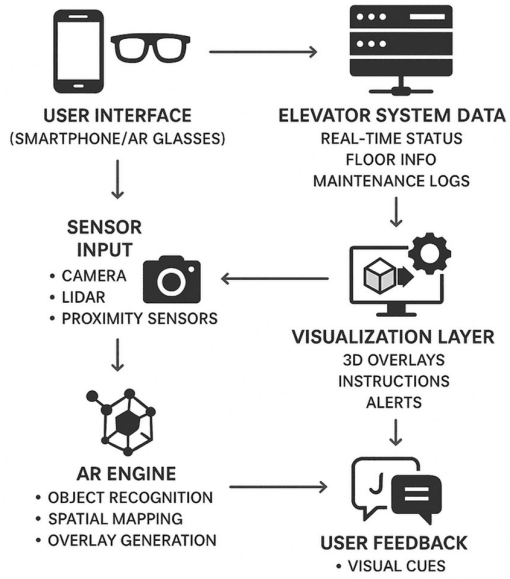



*Image source: https://zealar.com.au/amazing-ways-augmented-reality-can-have-a-positive-impact-on-society/*

## 4. Working Principle of Augmented Reality

*1*




## 5. Technologies Used for AR Implementation

Augmented Reality (AR) implementation involves a combination of hardware and software technologies. Below, we provide a non-exhaustive picture of some of most popular technologies used:

### Hardware Technologies

#### 1. AR Glasses and Headsets:

- Microsoft HoloLens: A mixed reality headset that overlays digital content onto the real world.

*Disclaimer 1: All AI-generated images used in this publication are for conceptual illustration only and were created using publicly available generative tools (Copilot). No real-world entities, individuals, or proprietary data are represented.*

- Magic Leap: A lightweight headset that provides immersive AR experiences.
- Google Glass: A wearable device that displays information in a hands-free format.

2. **Mobile Devices:**
   - Smartphones and Tablets: Devices equipped with cameras and sensors to support AR applications (e.g., iPhone with ARKit, Android devices with ARCore).
3. **Sensors and Cameras:**
   - Depth Sensors: Used to measure the distance between the device and objects in the environment (e.g., LiDAR sensors).
   - RGB Cameras: Capture real-world images and videos to overlay digital content.
   - IMUs (Inertial Measurement Units): Measure acceleration and rotation to track device movement.

**Software Technologies**

1. **AR Development Platforms**:
   - ARKit: Apple's framework for creating AR experiences on iOS devices.
   - AR Core: Google's platform for building AR applications on Android devices.
   - Vuforia: A widely used AR development platform that supports various devices and operating systems.
2. **3D Modelling and Animation Tools:**
   - Unity: A popular game engine used for creating 3D content and AR applications.
   - Unreal Engine: Another powerful game engine for developing high-quality AR experiences.
   - Blender: An open-source 3D modelling and animation tool.
3. **Computer Vision and Image Recognition:**
   - OpenCV: An open-source computer vision library used for image processing and object detection.

- TensorFlow: A machine learning framework that can be used for image recognition and other AI tasks.

4. **Cloud Services**:

- AWS (Amazon Web Services): Provides cloud computing resources for processing and storing AR data.
- Azure: Microsoft's cloud platform that supports AR applications with services like Azure Spatial Anchors.
- Google Cloud: Offers cloud-based tools and services for AR development.

5. **Spatial Mapping and Tracking:**

- SLAM (Simultaneous Localization and Mapping): A technology used to map the environment and track the device's position within it.
- Marker-based Tracking: Uses predefined markers (e.g., QR codes) to trigger AR content.
- Marker less Tracking: Uses feature points in the environment to anchor AR content without predefined markers.

## 6. AR Technology in Elevator Systems:

Augmented Reality (AR) technology creates an opportunity for significant strides in enhancing elevator systems by incorporating interactive images and visualizations. By overlaying digital images and data onto real-world views, AR could allow technicians and engineers to interact with complex elevator components in a more intuitive manner. For instance, using AR glasses or mobile devices, maintenance personnel could view detailed schematics and live diagnostic information superimposed over the actual machinery, facilitating faster and more accurate troubleshooting. This visual aid would not only simplify the repair process but also reduce the risk of errors with clear, step-by-step instructions for reference, directly in the technician's line of sight. Additionally, AR images could be used in training modules, offering immersive learning experiences where trainees could virtually explore and manipulate elevator parts, gaining hands-on experience without the need for physical components. In

passenger-facing scenarios, AR could enhance user engagement by projecting informative or entertaining images onto elevator walls, elevating the ride experience.

## 7. Key AR Applications in Sales:

3D Visualization of Elevator Cabins and Components: Using AR, customers can view how the elevator will appear in their building environment. This enhances clarity during design approval.

Virtual Showroom Experiences: AR allows customers to explore a virtual elevator showroom from their phone or tablet.

Real-Time Customization: Customers can change cabin interiors, panel finishes, lighting, and door types in real-time using AR apps.

Customer Engagement: Interactive experiences build trust and involvement, especially for high-end residential and commercial buyers.

Faster Decision Making: Reduced ambiguity may leads to quicker approvals and smoother project kick-offs.

## 8. Potential Key AR Applications in Installation:

Site Layout Visualization: Installers could preview machine room and shaft layouts before actual work begins. This may also help facilitate clarity and increase efficiency in working with others, such as general contractors and tradesmen throughout the construction process.

AR-Assisted Component Placement: Brackets, guide rails, and machine mounts could be installed with AR guidance, ensuring proper alignment and reducing rework. Step-by-Step Guided Procedures: Using AR glasses or tablets, technicians could receive visual prompts for each step of installation.

Remote Expert Assistance: Field technicians can connect with remote experts who could annotate the live AR view to guide them.

## 9. Potential Key AR Applications in Operation and Maintenance

AR-Enabled Troubleshooting: Common error codes, wiring diagrams, and mechanical fixes are overlaid on the actual hardware via AR.

Training: New technicians could use AR to simulate real-world repair scenarios in learning sessions without physical risk.

Remote Expert Assistance: AR tools can allow senior technicians to virtually inspect elevators and guide field teams remotely.

## 10. Potential Overall Benefits uses in Elevator Technology

1. **Enhanced Maintenance and Repair**: Technicians could use AR to visualize the inner workings of an elevator system without physically dismantling it. By overlaying digital information on the real-world view, they can quickly identify issues, follow step-by-step repair instructions, and reduce downtime.
2. **Efficient Training**: AR can provide immersive training experiences for elevator technicians. Instead of relying solely on manuals or videos, trainees can interact with virtual components overlaid on real equipment, allowing for hands-on learning without the risks associated with working on live systems.
3. **Improved Passenger Experience**: AR can be used to display interactive guides or instructions on elevator panels, helping users understand the system better or navigate complex buildings more easily.
4. **Remote Assistance**: With AR, experts could offer real-time, remote assistance to on-site technicians. By viewing the technician's AR feed, experts could guide them through complex repairs or troubleshooting processes, ensuring issues are resolved swiftly and accurately.
5. **Design and Planning**: Architects and engineers can use AR to visualize and plan elevator installations within new or existing buildings. This can enhance collaboration with stakeholders by providing a tangible view of how elevator systems will integrate with the structure.
6. **Customer Engagement**: For sales and demonstrations, AR can be used to showcase elevator features in a captivating way, allowing potential Customer to visualize how elevators would fit and operate within their specific environments.

7. **Interactive User Interfaces**: AR can transform elevator control panels into interactive displays that offer more than just buttons. Users could access building directories, news updates, or even customized content, enhancing the overall experience.

8. **Augmented Reality Manuals**: Instead of flipping through paper manuals, technicians can use AR apps to access digital manuals that display interactive 3D models and instructions directly on their devices, making complex information easier to understand and utilize.

9. **Spatial Awareness**: For those involved in the installation and maintenance of elevators in tight or complex spaces, AR provides a tool for better spatial awareness. It can help visualize how equipment will fit and operate within a given area, reducing installation errors and optimizing space usage.

10. **Marketing and Visualization**: Elevator companies can use AR to create virtual showrooms, allowing potential customers to visualize and interact with different elevator models and features in their own buildings before making a purchase decision.

11. **Enhanced Accessibility Features**: AR can offer additional accessibility options for those with disabilities, such as visual or auditory aids that assist in navigating elevator systems more comfortably and safely.

## Conclusion

AR has the potential to transform the elevator industry by enhancing sales, planning design, improving installation processes, helping with safety, aiding in maintenance and repairs, optimizing operations, and boosting operational efficiency.

## References


- Barteit S, Lanfermann L, Bärnighausen TW, Neuhann F, Beiersmann C. Augmented, mixed, and virtual reality-based head-mounted devices for medical education.

- Pace FD, Manuri F, Sanna A, Zappia D. A comparison between two different approaches for a collaborative mixed-virtual environment in industrial maintenance.
- Wang W, Zhou F, Wan Y, et al. Overview of metaverse technology
- Rojas-SánchezMA, Palos-Sánchez PR, Folgado-Fernández JA. Systematic literature review and bibliometric analysis on virtual reality and education.
- Bibliometric Analysis of Research in Pediatrics Related to Virtual and Augmented Reality: A Systematic Review.
- Xiao Q, Wang D, Shi KZ. Design of Virtual Simulation Experimental System for close coupling hook of multiple units.


## BIOGRAPHICAL DETAILS

**J. Keshav** is a seasoned Engineering executive currently employed at OTIS Elevator Company India in Bangalore. With extensive expertise in elevator systems and technology integration, he is instrumental in promoting innovation and operational excellence. His efforts are cantered around utilizing cutting-edge technologies like Augmented Reality (AR), elevator installation, and harmonization to improve elevator design, installation, and preventive maintenance.

**Mohammed Rizwan M** is a seasoned engineering professional currently serving at OTIS Elevator Company India, based in Bangalore. With deep expertise in elevator systems and technology integration, he plays a pivotal role in fostering innovation and ensuring operational excellence. His work primarily focuses on benchmarking various elevator products and modules, contributing to the enhancement of elevator design and performance.

**Mohamed Shameer** is a distinguished engineering professional with extensive expertise in elevator design and mechanical systems. Currently serving as Assistant Manager at OTIS India Limited, he spearheads global engineering module harmonization initiatives, formulates innovative design strategies, and streamlines the product portfolio to enhance operational efficiency and responsiveness to market dynamics.