

SMART PUBLIC RESTROOM

Project Definition:

The project's primary goal is to revolutionize public restroom management by implementing IOT (Internet of Things) sensors to monitor occupancy and maintenance requirements. By doing so, we aim to offer the general public real-time information on restroom availability and cleanliness through a user friendly platform or mobile application. This comprehensive project comprises several key elements.

Design Thinking:

Real-time Restroom Availability Information: *Provide the public with up to-the-minute data on the availability of restrooms in specific locations. This includes information on whether a restroom is currently in use or available for use.*

Cleanliness Monitoring: *The system injects a portion of biocidal substance with every flush to kill bacteria and odours. Besides, the system can provide workers with information about use frequency and even the amount of toilet paper left.*

Availability Indicators: *By means of red and green light, indicators notify washroom users on cubicles availability, which, in turn, reduces congestion. Since it is not always clear whether there is a free cubicle, there might occur situations when stalls remain unoccupied while there is a long line and nobody wants to leave the queue to check if all the stalls are indeed occupied. Therefore, these indicators prevent such cases and release of the necessity to knock or to try doors.*

Smart Tap: *A touch-free tap ensures washroom users are protected from Legionella bacteria. The tap monitors water and pipes temperature and condition to alert the supervisor in case there is a risk of Legionella development.*

IOT Sensors:

Occupancy Sensors: *These sensors detect when someone enters or exits the restroom. They are often used to control lighting, ventilation, and other systems to save energy when the restroom is unoccupied.*

Motion Sensors: *Motion sensors can trigger various functions such as flushing toilets, activating faucets, and dispensing soap or paper towels when they detect movement within their range.*

Touchless Flush Sensors: *These sensors automatically flush toilets or urinals after use, reducing the need for physical contact with flush handles.*

Touchless Soap Dispensers: *Automatic soap dispensers use sensors to release soap when hands are placed beneath them, promoting hand hygiene.*

Air Quality Sensors: *These sensors monitor air quality, detecting factors like humidity, temperature, and odours. They can adjust ventilation systems as needed to maintain a comfortable and fresh environment.*

Toilet Seat Sensors: *Some smart restrooms have sensors on toilet seats to detect if they are occupied or not, helping users find available facilities quickly.*

Water Quality Sensors: *These sensors monitor the quality of water in sinks and toilets and can trigger maintenance alerts when issues are detected, ensuring that water quality meets safety standards.*

Waste Bin Sensors: *Sensors in waste bins can notify cleaning staff when bins are full, optimizing waste management and ensuring that bins are emptied promptly.*

Emergency Sensors: *In case of emergencies, such as fire or flooding, sensors can detect abnormal conditions and trigger alarms or notifications to alert authorities or maintenance personnel.*

Occupancy Tracking Sensors: *These sensors collect data on restroom usage patterns, which can be analysed to optimize cleaning schedules, resource allocation, and restroom layout design.*

Sound Sensors: *Sound sensors can monitor noise levels within the restroom and alert staff or security personnel in case of disturbances or potential safety concerns.*

Integration Approach:

To ensure seamless data flow from IOT sensors to the restroom information platform, consider the following integration strategies.

IOT Connectivity: *Utilize Wi-Fi, Bluetooth, or other suitable IOT connectivity protocols to transmit data from sensors to a central data hub.*

Data Processing: *Implement data processing and analysis algorithms to interpret sensor data in real-time. This includes identifying occupancy patterns and cleanliness metrics.*

Cloud-Based Infrastructure: *Host the restroom information platform on a cloud infrastructure for scalability and accessibility.*

API s: *Develop application programming interfaces (API s) to facilitate data exchange between the sensor network and the platform.*

By focusing on these key elements, we will create an innovative solution that not only enhances public restroom management but also significantly improves the user experience, making public facilities more efficient and userfriendly. This project represents a cutting-edge approach to addressing a common urban challenge and demonstrates the potential of IOT technology to enhance everyday life.