**Phase 2: Innovation**

**Smart Public Restroom**

**1. Initial Planning and Feasibility:**

• Assess the project's financial scope and funding origins.

• Evaluate the readiness of necessary technologies and infrastructure.

• Examine local building codes, regulations, and accessibility standards.

• Formulate a comprehensive project strategy, including schedules and key milestones.

• Obtain the required permits, endorsements, and compliance documentation.

**2. Procurement of Resources:**

• Acquire all essential hardware components, including sensors, touchless fixtures, security cameras, and IoT devices.

**Sensors:**

**1. Occupancy Sensors:** These sensors detect individuals' presence in the restroom, aiding in real-time usage monitoring for managing cleaning schedules and assessing occupancy. They also provide users with real-time availability and wait time information.

**2. Water Flow Sensors:** Installed in water supply lines, these sensors monitor water consumption, promoting efficiency by detecting leaks, flow rates, and the performance of water-saving fixtures. This data can optimize water usage.

**3. Air Quality Sensors:** These sensors measure humidity, temperature, and air quality (e.g., CO2 levels) to maintain a comfortable and healthy environment by regulating temperature, humidity, and ventilation.

**4. Touchless Sensors:** Infrared or capacitive sensors in faucets, soap dispensers, and flush systems enable touchless operation, enhancing hygiene and reducing germ spread.

**5. Occupancy Indicator Sensors:** Placed outside the restroom, these sensors indicate occupancy status, reducing wait times and enhancing user experience.

**6. Security Cameras:** Essential for security and safety, these cameras deter vandalism and provide a record of restroom activities.

**7. Light and Motion Sensors:** Used for energy efficiency, they ensure lights are activated only when needed, reducing energy consumption.

**8. Rainwater Harvesting Sensors:** In rainwater harvesting systems, these sensors monitor rainwater availability and levels, promoting sustainability.

**9. Sound Sensors:** Control ambient sounds for a more pleasant and private atmosphere.

**10. Temperature Sensors:** Maintain a comfortable environment by regulating heating and cooling systems.

**3. Formation of a Multidisciplinary Team:**

• Assemble a diverse, cross-functional team with expertise in architecture, interior design, electrical engineering, plumbing, software development, and data analysis.

• Appoint a project manager for team coordination, timelines, and communication.

**4. Detailed Design and Blueprints:**

• Develop architectural blueprints detailing fixture, sensor, and hardware component placement.

• Create technical schematics for electrical and data connections.

• Ensure compliance with local building codes and accessibility standards.

**5. Development and Testing:**

• Create a user-friendly mobile app with real-time restroom availability, feedback collection, and voice-activated controls.

• Implement and rigorously test the IoT platform for functionality, security, and cross-device compatibility.

**6. Hardware Installation and Integration:**

• Physically install fixtures, sensors, security cameras, and hardware components as per design plans.

• Verify proper connectivity and power supply.

• Establish robust integration between hardware and the IoT platform for real-time data collection and control.

**7. Data Analytics and Security:**

• Establish a comprehensive data analytics system for data collection, storage, and analysis from sensors and user interactions.

• Implement stringent security measures to protect user data, privacy, and camera footage security, adhering to data protection regulations.

**8. Accessibility and Sustainability:**

• Ensure compliance with accessibility standards, including wheelchair access, clear signage, and voice-activated controls.

• Confirm the sustainability features' proper functioning, such as solar panels and rainwater harvesting systems.

**9. User Testing and Feedback:**

• Conduct extensive user testing with diverse groups to assess restroom design, functionality, and user-friendliness.

• Actively gather user feedback to identify areas for improvement in design and functionality.

• Utilize feedback to make necessary adjustments and enhancements.

**10. Deployment, Scaling, and Maintenance:**

• Deploy the smart public restroom in a controlled pilot location to assess real-world performance, user satisfaction, and operational efficiency.

• Based on the pilot's success, plan and implement expansion to multiple locations, maintaining consistency in design and functionality.

• Establish regular monitoring routines for system performance, including hardware and software, and proactively address issues through predictive maintenance strategies.