

## C. Example of Requirements List made with ReqGPT for Smart light Bulb

**Prompt:** Make an Engineering Requirements Document for Smart light bulbs

Product Design Specifications Document for Smart Light Bulbs

### 1. Main Function

Description	<ul style="list-style-type: none"><li>- The smart light bulb is designed to provide illumination with enhanced functionality through connectivity and intelligent features.</li><li>- The primary purpose is to serve as a traditional light source while integrating smart home automation capabilities.</li></ul>
Key Features	<ul style="list-style-type: none"><li>- Wi-Fi/Bluetooth Connectivity: Enables the bulb to connect to a smart home network.</li><li>- Voice Control: Compatibility with voice assistants like Amazon Alexa, Google Assistant, and Apple Siri.</li><li>- Remote Control: App-based control through a smartphone or tablet.</li><li>- Scheduling: Ability to schedule on/off times and light levels.</li><li>- Motion Detection: Automatic lighting based on motion detection.</li><li>- Color Temperature Control: Adjustable color temperature from warm to cool.</li><li>- Dimming Capabilities: Smooth dimming functionality.</li><li>- Energy Efficiency: Designed to use less energy than traditional bulbs.</li><li>- Multi-User Support: Allows multiple users to control the bulb from different locations.</li></ul>

### 2. Functionally Determined Properties

Performance	<ul style="list-style-type: none"><li>- Power Output: Maximum 1600 lumens.</li></ul>
Requirements	<ul style="list-style-type: none"><li>- Efficiency: Minimum 80% energy efficiency rated by ENERGY STAR.</li><li>- Input Voltage: 110-240V AC.</li><li>- Operating Frequency: 2.4 GHz for Wi-Fi, 2.4 GHz for Bluetooth.</li><li>- Lighting Modes: Multiple modes including standard, dim, warm, cool, and color changing.</li><li>- Color Temperature Range: 2700K (warm) to 6500K (cool).</li><li>- Brightness Levels: 0% to 100%.</li><li>- Response Time: Less than 1 second for command execution.</li><li>- Operating Modes: Ambient, task lighting, and accent lighting.</li></ul>
Functionality	<ul style="list-style-type: none"><li>- Smart Home Integration: Must integrate with popular smart home systems.</li><li>- App Interface: User-friendly mobile app for iOS and Android.</li><li>- Voice Commands: Support for basic commands like "on," "off," "brightness," and "color."</li><li>- Scheduling: Ability to set schedules for different days of the week and times of the day.</li><li>- Motion Detection: Adjustable sensitivity and delay settings.</li><li>- Firmware Updates: Over-the-air (OTA) firmware updates for security and feature enhancements.</li><li>- Multi-Device Support: Compatibility with multiple smart devices and assistants.</li></ul>

### 3. Operational Properties

Operating Conditions	<ul style="list-style-type: none"><li>- Temperature Range: -20Å°C to 50Å°C (-4Å°F to 122Å°F).</li><li>- Humidity: 10% to 90% non-condensing.</li><li>- Indoor/Outdoor Use: Suitable for indoor use only.</li><li>- EMI/RFI Shielding: Effective shielding to prevent interference with other devices.</li><li>- Lighting Conditions: Operates under various lighting conditions including direct sunlight and low light environments.</li></ul>
----------------------	---

### User Interaction	- Mobile App: Intuitive app interface with easy-to-navigate menus.
	- Voice Interface: Clear voice prompts and feedback.
	- Mechanical Controls: Minimal physical buttons, perhaps just a power button.
	- LED Indicators: Visual indicators for power, connectivity, and operational status.
	- Feedback Systems: Immediate visual and auditory feedback for user actions.
### Support Systems	- Network Requirements: Stable Wi-Fi connection with 2.4 GHz band support.
	- Software Requirements: Compatible with iOS 10+ and Android 5.0+.
	- External Devices: Compatibility with smart home hubs and routers.
	- Customer Support: 24/7 customer support hotline and online chat.
	- Firmware Updates: Regular firmware updates available through the mobile app.

#### 4. Service Life and Maintainability

Expected Lifespan	- Operational Lifespan: 15,000 hours (equivalent to 10 years of operation at 3 hours per day).
	- Maintenance Intervals: Minimal maintenance required; check connections every 6 months.
	- MTBF (Mean Time Between Failures): 50,000 hours.
Common Pitfalls and Important Product Parts	- Core Modules:
	- LED Module: High-efficiency LED array.
	- Control Board: Microcontroller unit for smart functionality.
	- Power Supply: Adjustable AC/DC power supply.
	- Connectivity Module: Wi-Fi and Bluetooth chips.
	- Sensors: Motion and light sensors.
	- Fault Tolerance:
	- LED Failure Rate: Less than 1% per 10,000 hours.
	- Connectivity Loss Rate: Less than 0.1% per 10,000 hours.
	- Redundancy Systems:
End-of-Life Handling	- Backup Power: Battery backup for up to 2 hours of operation during power outages.
	- Dual-Band Connectivity: Fallback to Bluetooth if Wi-Fi connection is lost.
	- Recycling: LED components and circuit boards should be recyclable.
	- Refurbishing: Options for refurbishing bulbs with minor wear and tear.
	- Disposal: Environmentally friendly disposal procedures for non-recyclable parts.
Service Manuals	- Environmental Impact: Minimize use of hazardous materials like lead and mercury.
	- Maintenance Procedures:
	- Bulb Replacement: Step-by-step guide for replacing the LED bulb.
	- Firmware Updates: Instructions for updating firmware via the mobile app.
	- Troubleshooting: Common issues and solutions for connectivity, power, and performance problems.
Standardized Parts	- Schematic Diagrams: Detailed diagrams of the internal circuitry and component layout.
	- Parts List: Comprehensive list of all parts with part numbers and suppliers.
	- LED Module: Standardized across all models.
	- Control Board: Modular design with interchangeable components.
	- Power Supply: Standardized AC/DC adapter.
5. Safety	- Sensors: Standard motion and light sensors.
	- Connectivity Modules: Universal Wi-Fi and Bluetooth chips.
	- Auto-Shutoff Features:
	- Overheat Protection: The bulb should automatically shut off when internal temperature exceeds 120°C (248°F).

	<ul style="list-style-type: none"> <li>- <i>Power Surge Protection:</i> Built-in surge protector to cut off power during voltage spikes.</li> <li>- <i>Timer-Based Shutoff:</i> Automatically turn off after a predefined period (e.g., 8 hours) if no command is received.</li> </ul>
<i>Protective Features</i>	<ul style="list-style-type: none"> <li>- <i>Guards and Shields:</i></li> <li>- <i>Glass Cover:</i> Tempered glass to prevent breakage.</li> <li>- <i>Electrical Insulation:</i> Double-layered insulation to prevent electrical leakage.</li> <li>- <i>Testing Methods:</i></li> <li>- <i>Drop Test:</i> Must withstand being dropped from a height of 1.5 meters without functional damage.</li> <li>- <i>Moisture Resistance Test:</i> Pass IP65 water and dust resistance test.</li> <li>- <i>Warnings:</i></li> <li>- <i>On-Device Labels:</i> Clear warnings about high temperatures and the risk of electrical injury.</li> <li>- <i>User Manual:</i> Detailed safety instructions included in the product manual.</li> </ul>

## 6. Ergonomic Properties

<i>User Interface</i>	<ul style="list-style-type: none"> <li>- <i>Control Types:</i></li> <li>- <i>Touch Controls:</i> Capacitive touch sensors on the bulb for basic functions.</li> <li>- <i>Mobile App:</i> Advanced settings and customization via the mobile app.</li> <li>- <i>Voice Control:</i> Integration with voice assistants for hands-free operation.</li> </ul>
<i>Accessibility</i>	<ul style="list-style-type: none"> <li>- <i>Maintenance Access:</i></li> <li>- <i>Removable Cover:</i> Easy-to-remove cover for accessing internal components.</li> <li>- <i>Tool-Free Design:</i> No need for specialized tools for maintenance.</li> <li>- <i>Modular Design:</i></li> <li>- <i>Replaceable Components:</i> LED module, control board, and power supply can be replaced independently.</li> <li>- <i>Standard Connections:</i> Use of standardized connectors for easy replacement and upgrades.</li> </ul>
<i>Physical Comfort</i>	<ul style="list-style-type: none"> <li>- <i>Ergonomic Shape:</i></li> <li>- <i>Bulb Design:</i> Slightly asymmetrical design to avoid glare.</li> <li>- <i>Interaction Points:</i> Smooth edges and rounded surfaces for user comfort.</li> <li>- <i>Height Adjustability:</i></li> <li>- <i>Mounting Options:</i> Optional mounting bracket with adjustable height.</li> </ul>
<i>Visual and Auditory Feedback</i>	<ul style="list-style-type: none"> <li>- <i>Visual Signals:</i></li> <li>- <i>LED Indicators:</i> Multi-color LEDs to indicate power, connectivity, and operational status.</li> <li>- <i>Status Display:</i> On-screen notifications in the mobile app.</li> <li>- <i>Auditory Signals:</i></li> <li>- <i>Sound Alerts:</i> Audible tones for successful commands and errors.</li> <li>- <i>Voice Announcements:</i> Voice prompts for operational status and user actions.</li> </ul>
<i>Dimensions</i>	<ul style="list-style-type: none"> <li>- <i>Exact Dimensions:</i></li> <li>- <i>Height:</i> 120 mm</li> <li>- <i>Diameter:</i> 50 mm</li> <li>- <i>Space Requirements:</i></li> <li>- <i>Ventilation:</i> Minimum 10 mm clearance for airflow.</li> <li>- <i>Connections:</i> Additional 20 mm clearance for power and data cables.</li> </ul>

## 7. Appearance and Design

<i>Aesthetic Design</i>	<ul style="list-style-type: none"> <li>- <i>Visual Appeal:</i></li> <li>- <i>Color Options:</i> Available in white, black, and metallic finishes.</li> <li>- <i>Shape:</i> Sleek, cylindrical design with a smooth finish.</li> <li>- <i>Trend Alignment:</i></li> <li>- <i>Minimalist Design:</i> In line with current home automation trends.</li> <li>- <i>Customizability:</i> Optional custom color options for bulk orders.</li> </ul>
-------------------------	--

Finish and Materials	<ul style="list-style-type: none"> <li>- Durable Finishes: <ul style="list-style-type: none"> <li>- Electroplating: For metallic finishes to prevent corrosion.</li> <li>- Powder Coating: For non-metallic parts to ensure durability.</li> </ul> </li> <li>- Material Choices: <ul style="list-style-type: none"> <li>- Glass: Tempered glass for the outer casing.</li> <li>- Plastic: High-impact ABS plastic for non-glass parts.</li> </ul> </li> </ul>
Branding	<ul style="list-style-type: none"> <li>- Logo Placement: <ul style="list-style-type: none"> <li>- Front Panel: Small, illuminated logo near the base.</li> <li>- Color Scheme: Align with the brand's color palette.</li> </ul> </li> <li>- User Experience: <ul style="list-style-type: none"> <li>- Branded App: Custom app with branding elements and intuitive UX.</li> <li>- Packaging: Attractive, eco-friendly packaging reflecting the brand image.</li> </ul> </li> </ul>

## 8. Law and Standards

Regulatory Compliance	<ul style="list-style-type: none"> <li>- Local Regulations: <ul style="list-style-type: none"> <li>- Safety Standards: Comply with local electrical safety regulations.</li> <li>- Environmental Laws: Adhere to regulations for disposal and recycling.</li> </ul> </li> <li>- National Regulations: <ul style="list-style-type: none"> <li>- ENERGY STAR: Must meet ENERGY STAR requirements for energy efficiency.</li> <li>- FCC: Compliance with Federal Communications Commission regulations for wireless devices.</li> </ul> </li> <li>- International Regulations: <ul style="list-style-type: none"> <li>- RoHS: Restriction of Hazardous Substances Directive compliance.</li> <li>- WEEE: Waste Electrical and Electronic Equipment Directive compliance for recycling.</li> </ul> </li> </ul>
Certifications	<ul style="list-style-type: none"> <li>- Required Certifications: <ul style="list-style-type: none"> <li>- CE Mark: Conformity with European health, safety, and environmental protection standards.</li> <li>- FCC Certification: Compliance with U.S. Federal Communications Commission regulations.</li> <li>- ISO 9001: Quality management system certification.</li> </ul> </li> <li>- Certification Plan: <ul style="list-style-type: none"> <li>- Testing Phases: Pre-production testing for compliance.</li> <li>- Responsible Parties: Assign an internal compliance officer and external certification agency.</li> </ul> </li> </ul>
Relevant Patents	<ul style="list-style-type: none"> <li>- Existing Patents: <ul style="list-style-type: none"> <li>- Patent 1234567: Covers wireless control of lighting fixtures.</li> <li>- Patent 8765432: Relates to dimmable LED bulbs with color temperature control.</li> </ul> </li> <li>- Affected Aspects: <ul style="list-style-type: none"> <li>- Connectivity: Must use proprietary or licensed wireless technology.</li> <li>- Color Temperature Adjustment: Must innovate around existing mechanisms or obtain licensing.</li> </ul> </li> </ul>

## 9. Economics

Pricing Strategy	<ul style="list-style-type: none"> <li>- Budget Pricing: <ul style="list-style-type: none"> <li>- Price Range: \$20 - \$40</li> <li>- Features: Basic Wi-Fi connectivity, limited color options, no app integration.</li> </ul> </li> <li>- Middle of the Market: <ul style="list-style-type: none"> <li>- Price Range: \$50 - \$80</li> <li>- Features: Full smart home integration, multiple color options, app control, voice assistance.</li> </ul> </li> <li>- Premium: <ul style="list-style-type: none"> <li>- Price Range: \$100 - \$150</li> </ul> </li> </ul>
------------------	---

- *Features: Advanced features like customizable scenes, enhanced security, superior build quality.*
- 

*Alternative  
Revenue  
Strategies*

- *Subscription Model:*
  - *Service: Monthly subscription for advanced features like remote diagnostics and extended warranty.*
  - *Content: Access to exclusive lighting scenes and patterns.*
- *Consumables:*
  - *Bulbs: Sell replacement bulbs at a lower cost with higher margins on the main product.*
  - *Accessories: Additional sensors and control units.*
- *Freemium Model:*
  - *Base Product: Offer the basic product for free with in-app purchases for additional features.*
  - *Advertising: Incorporate non-intrusive ads in the mobile app for revenue.*