

Chapter 2

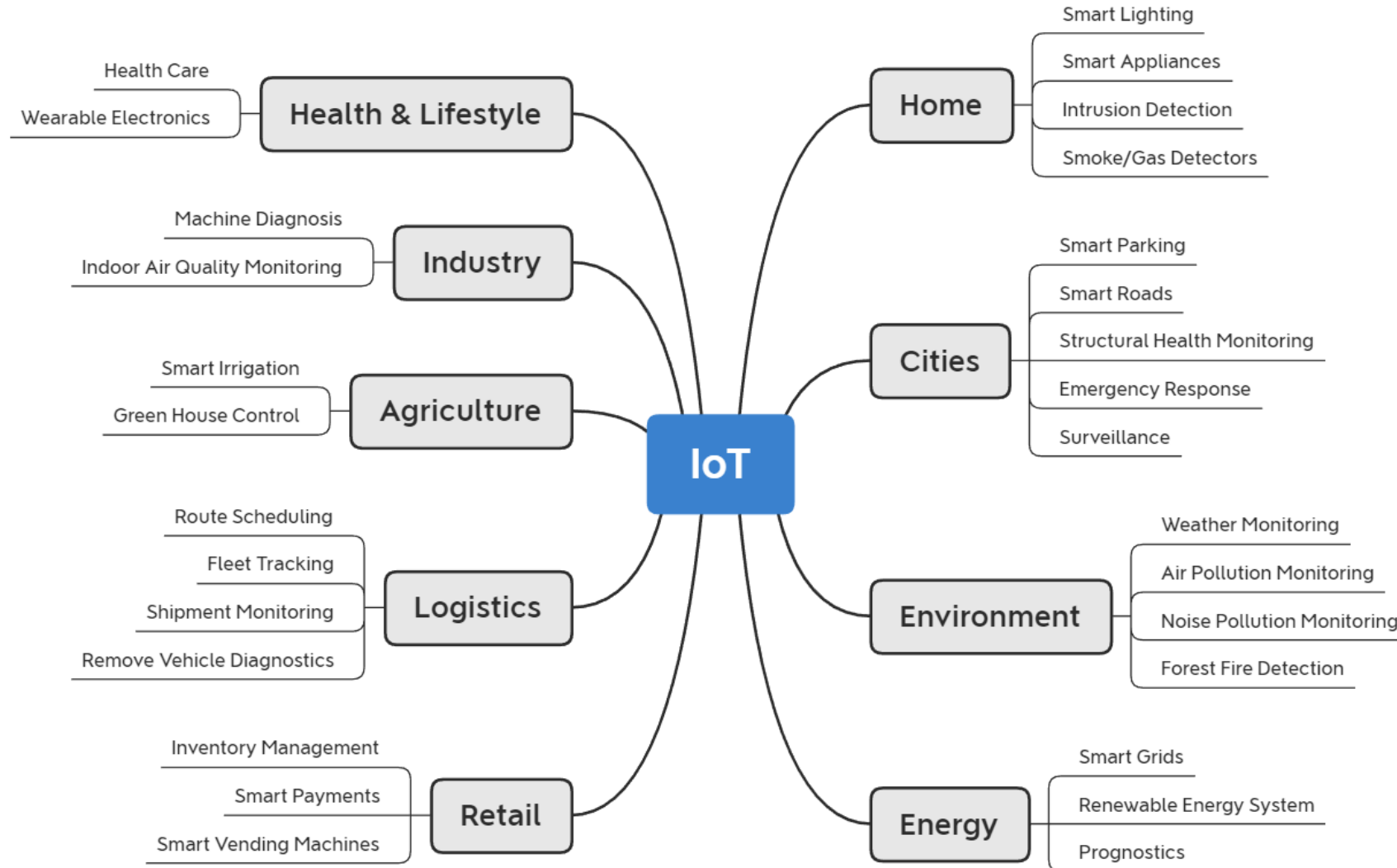
Domain Specific IoTs



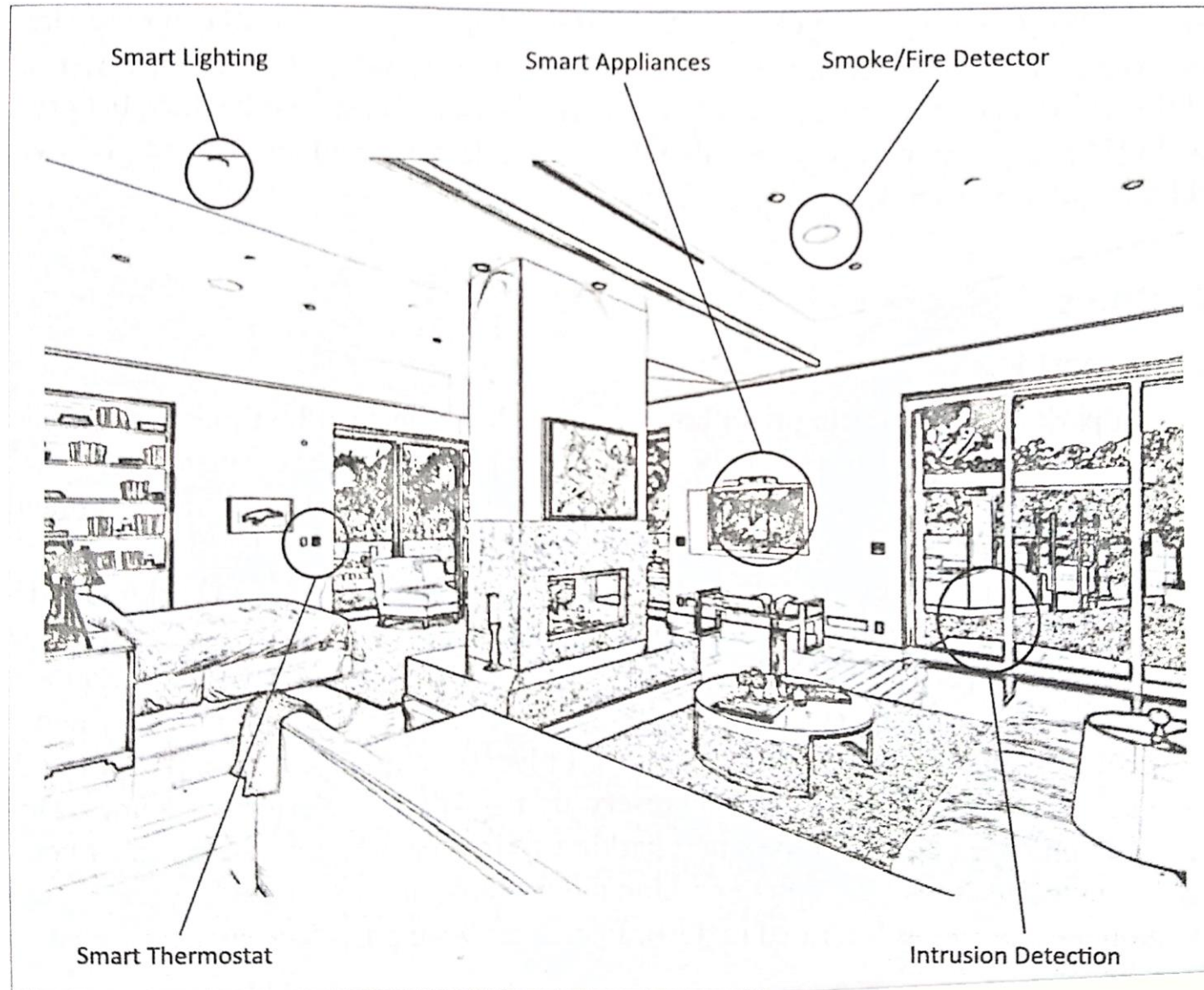
Outline

- Introduction
- Home Automation
- Cities
- Environment
- Energy
- Retail
- Logistics
- Agriculture
- Industry
- Health & Lifestyle

Introduction – Applications of IoT



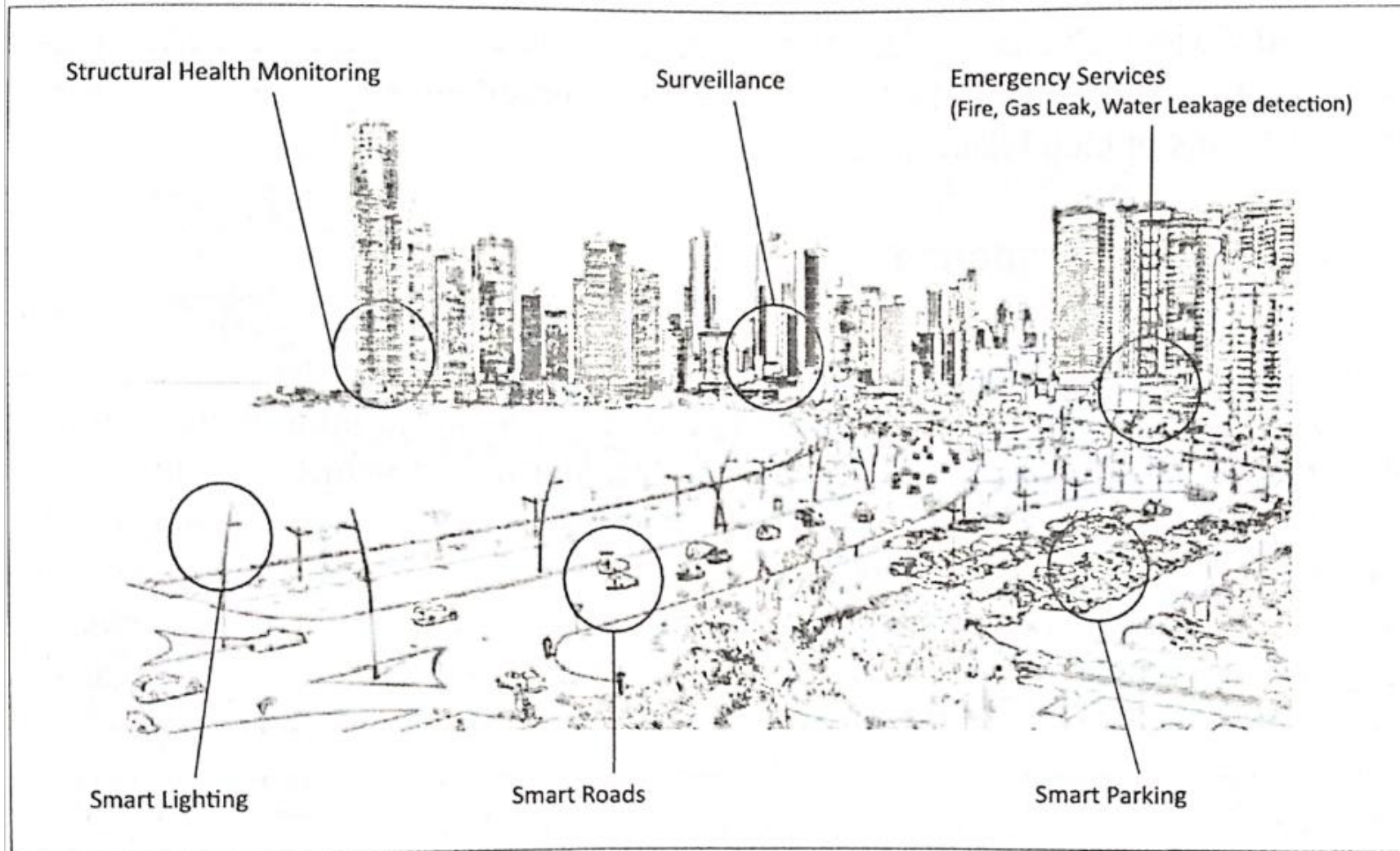
Home Automation



Home Automation (2/2)

- Smart Lighting
 - Control lighting by remotely (mobile or web applications)
- Smart Appliances
 - Provide status information to the users remotely
- Intrusion Detection
 - Use security cameras and sensors (PIR sensors and door sensors)
 - Detect intrusions and raise alerts
 - The alerts form: an SMS or an email sent to the user
- Smoke/Gas Detectors
 - Use optical detection, ionization, or air sampling techniques to detect the smoke
 - Gas detectors can detect harmful gases
 - Carbon monoxide (CO)
 - Liquid petroleum gas (LPG)
 - Raise alerts to the user or local fire safety department

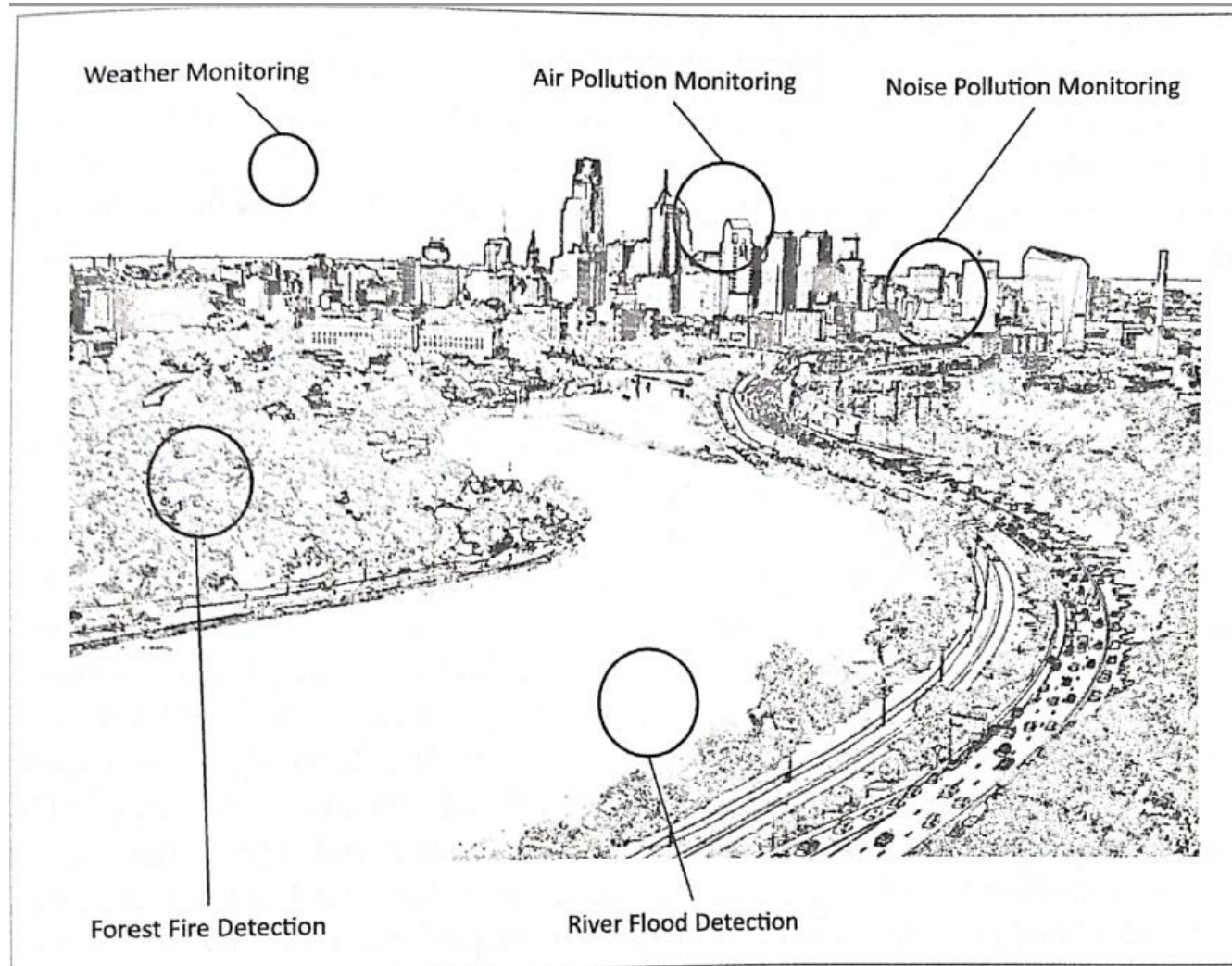
Cities (1/2)



Cities (2/2)

- Smart Parking
 - Detect the number of empty parking slots
 - Send the information over the internet and accessed by smartphones
- Smart Roads
 - Provide information on driving conditions, traffic congestions, accidents
 - Alert for poor driving conditions
- Structural Health Monitoring
 - Monitor the vibration levels in the structures (bridges and buildings)
 - Advance warning for imminent failure of the structure
- Surveillance
 - Use the large number of distributed and internet connected video surveillance cameras
 - Aggregate the video in cloud-based scalable storage solutions
- Emergency Response
 - Used for critical infrastructure monitoring
 - Detect adverse events

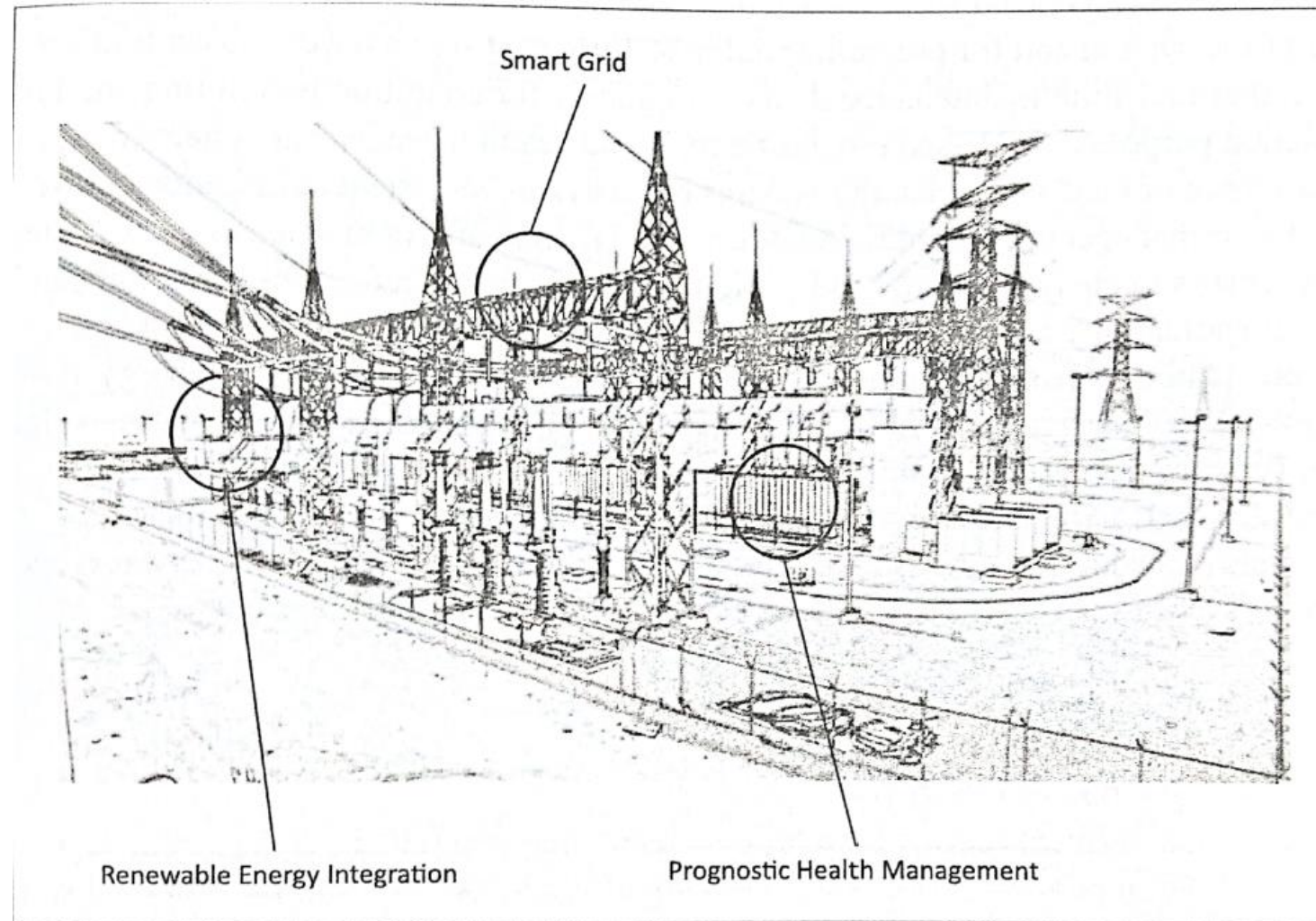
Environment (1/2)



Environment (2/2)

- Weather Monitoring
 - Collect data from several sensors (temperature, humidity, pressure, etc.)
 - Send the data to cloud-based applications and storage back-ends
- Air Pollution Monitoring
 - Monitor emission of harmful gases (CO_2 , CO , NO , NO_2 , etc.)
 - Factories and automobiles use gaseous and meteorological sensors
 - Integration with a single-chip microcontroller, several air pollution sensors, GPRS-modem, and a GPS module
- Noise Pollution Monitoring
 - Use a number of noise monitoring stations
 - Generate noise maps from data collected
- Forest Fire Detection
 - Use a number of monitoring nodes deployed at different locations in a forests
 - Use temperature, humidity, light levels, etc.
 - Provide early warning of potential forest fire
 - Estimates the scale and intensity
- River Floods Detection
 - Monitoring the water level (using ultrasonic sensors) and flow rate (using the flow velocity sensors)
 - Raise alerts when rapid increase in water level and flow rate is detected

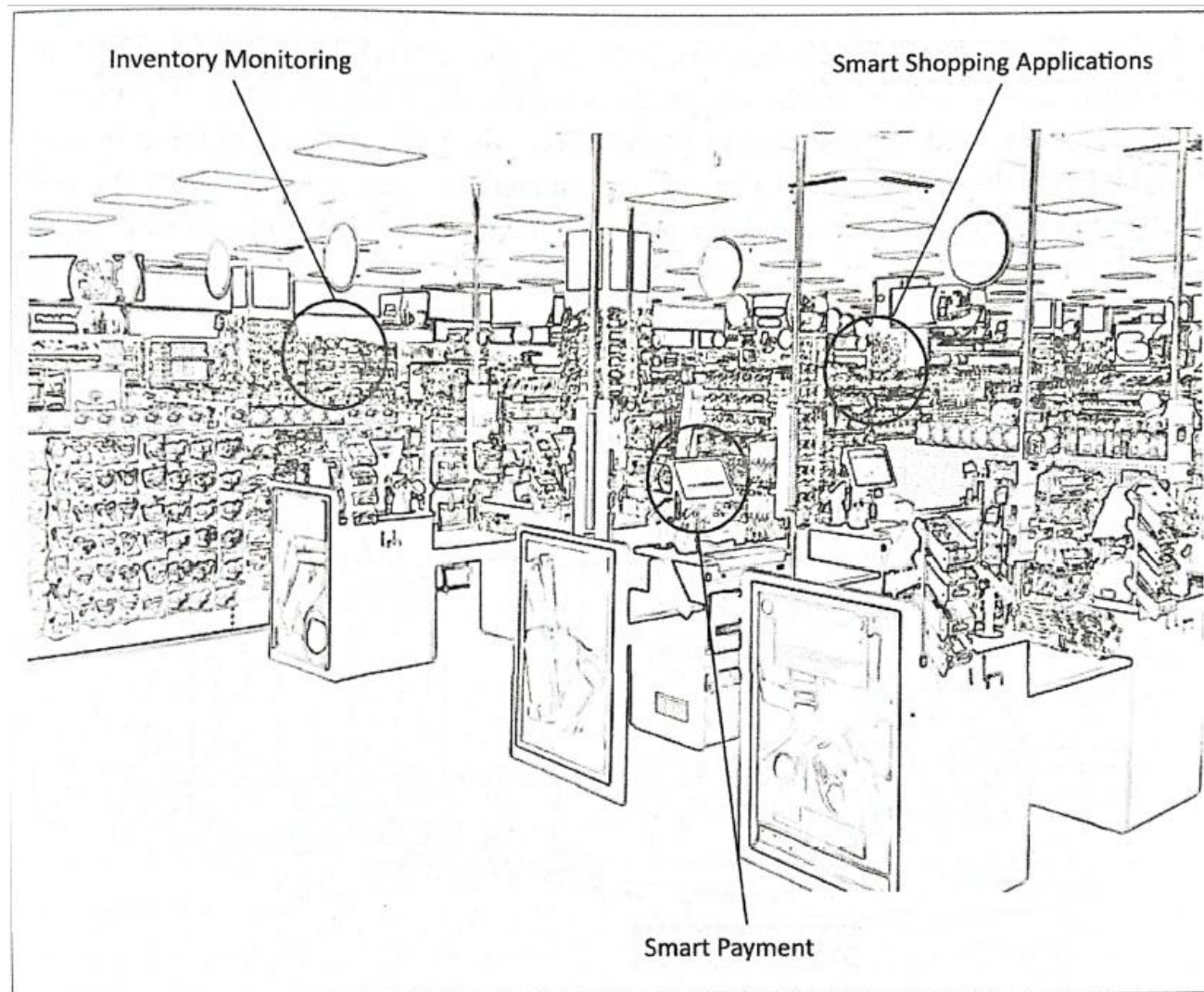
Energy (1/2)



Energy (2/2)

- Smart Grids
 - Collect data regarding electricity generation, consumption, storage (conversion of energy into other forms), distribution, equipment health data
 - Control the consumption of electricity
 - Remotely switch off supply
- Renewable Energy Systems
 - Measure the electrical variables
 - Measure how much the power is fed into the grid
- Prognostics
 - Predict performance of machines or energy systems
 - By collect and analyze the data from sensors

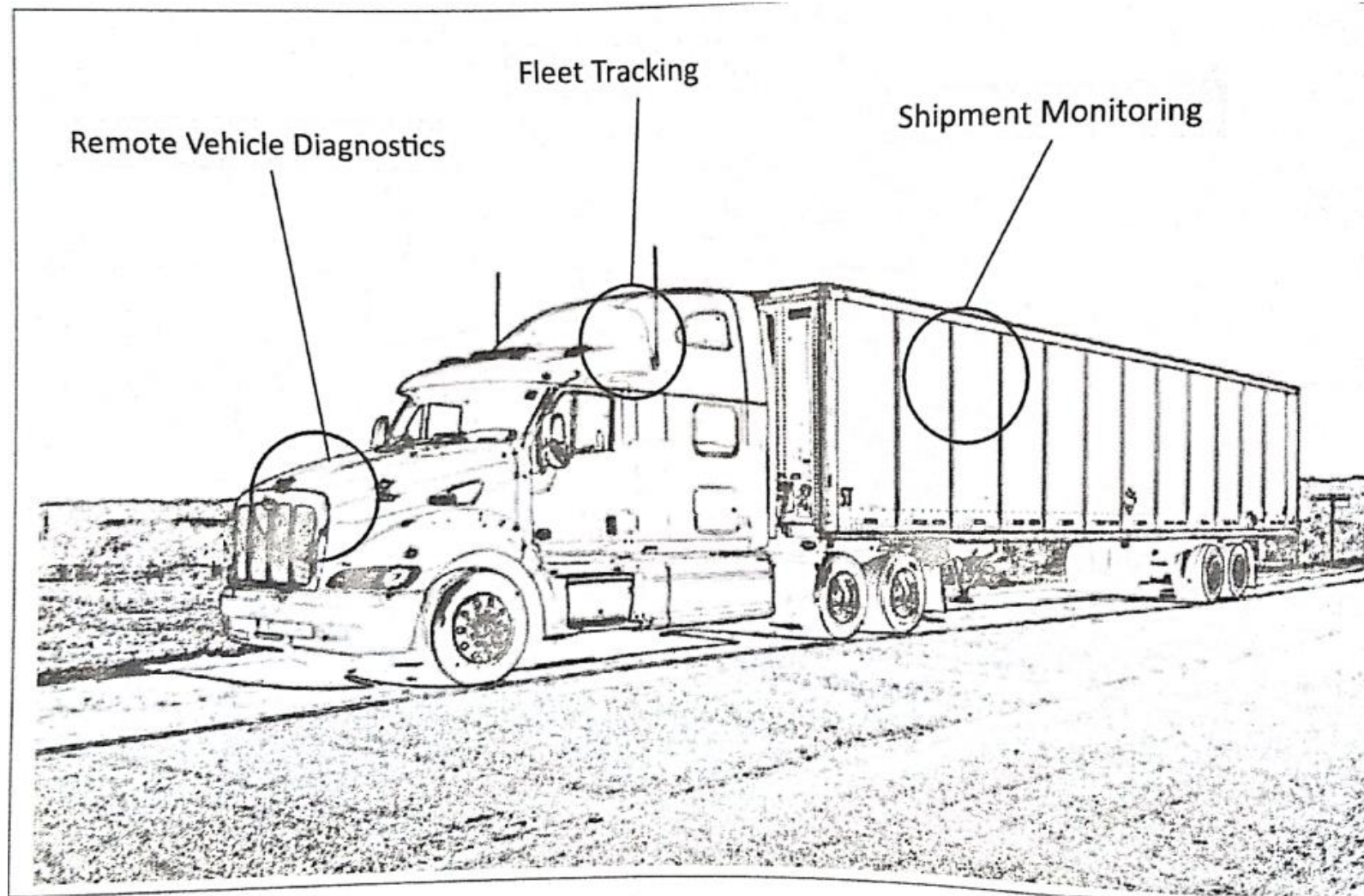
Retail (1/2)



Retail (2/2)

- Inventory Management
 - Monitoring the inventory by the RFID readers
 - Tracking the products
- Smart Payments
 - Use the NFC
 - Customers store the credit card information in their NFC-enabled
- Smart Vending Machines
 - Allow remote monitoring of inventory levels
 - Elastic pricing of products
 - Contact-less payment using NFC
 - Send the data to the cloud for predictive maintenance
 - The information of inventory levels
 - The information of the nearest machine in case a product goes out of stock in a machine

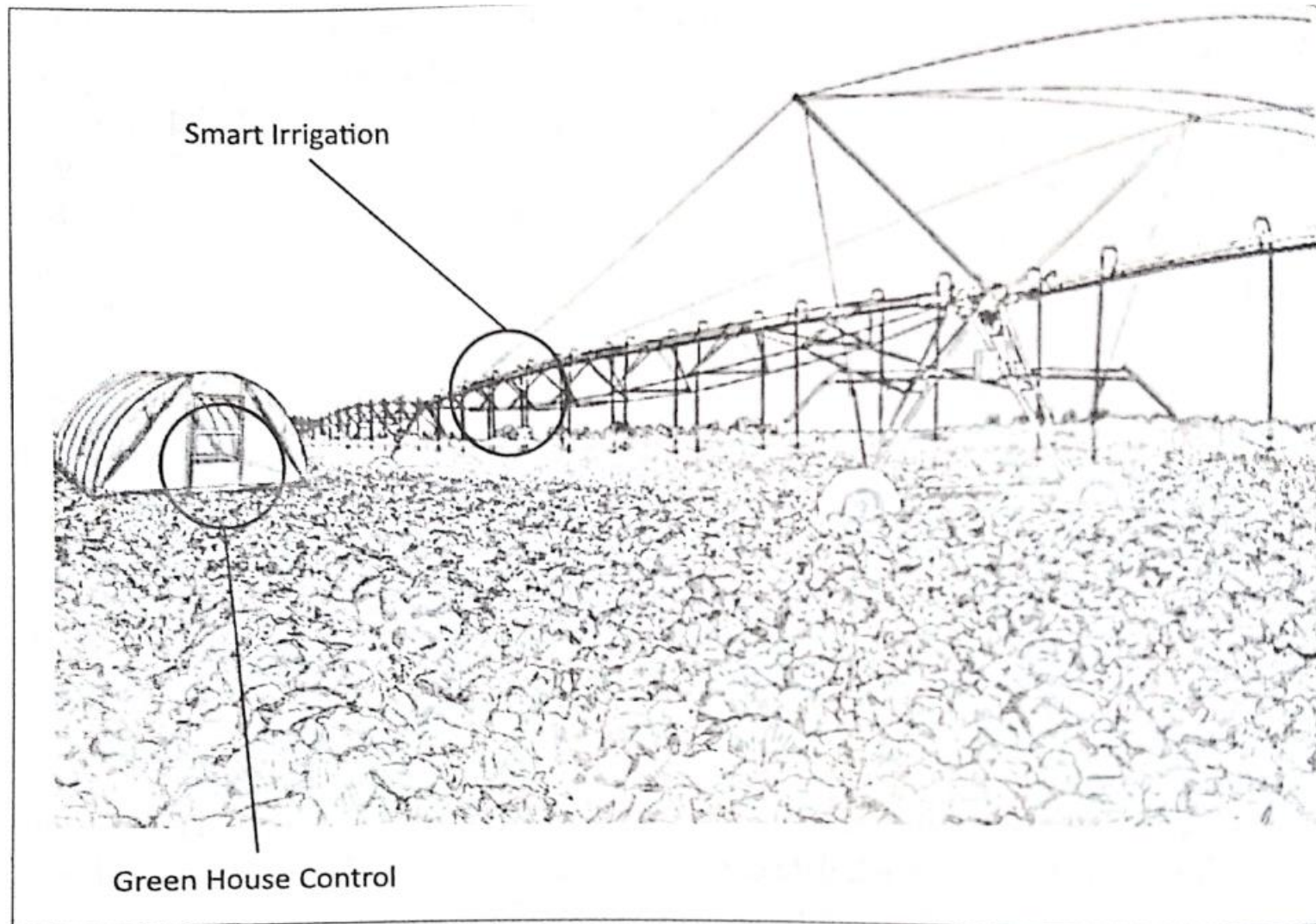
Logistics (1/2)



Logistics (2/2)

- Route Generation & Scheduling
 - Generate end-to-end routes using combination of route patterns
 - Provide route generation queries
 - Can be scale up to serve a large transportation network
- Fleet Tracking
 - Track the locations of the vehicles in real-time
 - Generate alerts for deviations in planned routes
- Shipment monitoring
 - Monitoring the conditions inside containers
 - Using sensors (temperature, pressure, humidity)
 - Detecting food spoilage
- Remote Vehicle Diagnostics
 - Detect faults in the vehicle
 - Warn of impending faults
 - IoT collects the data on vehicle (speed, engine RPM, coolant temperature)
 - Generate alerts and suggest remedial actions

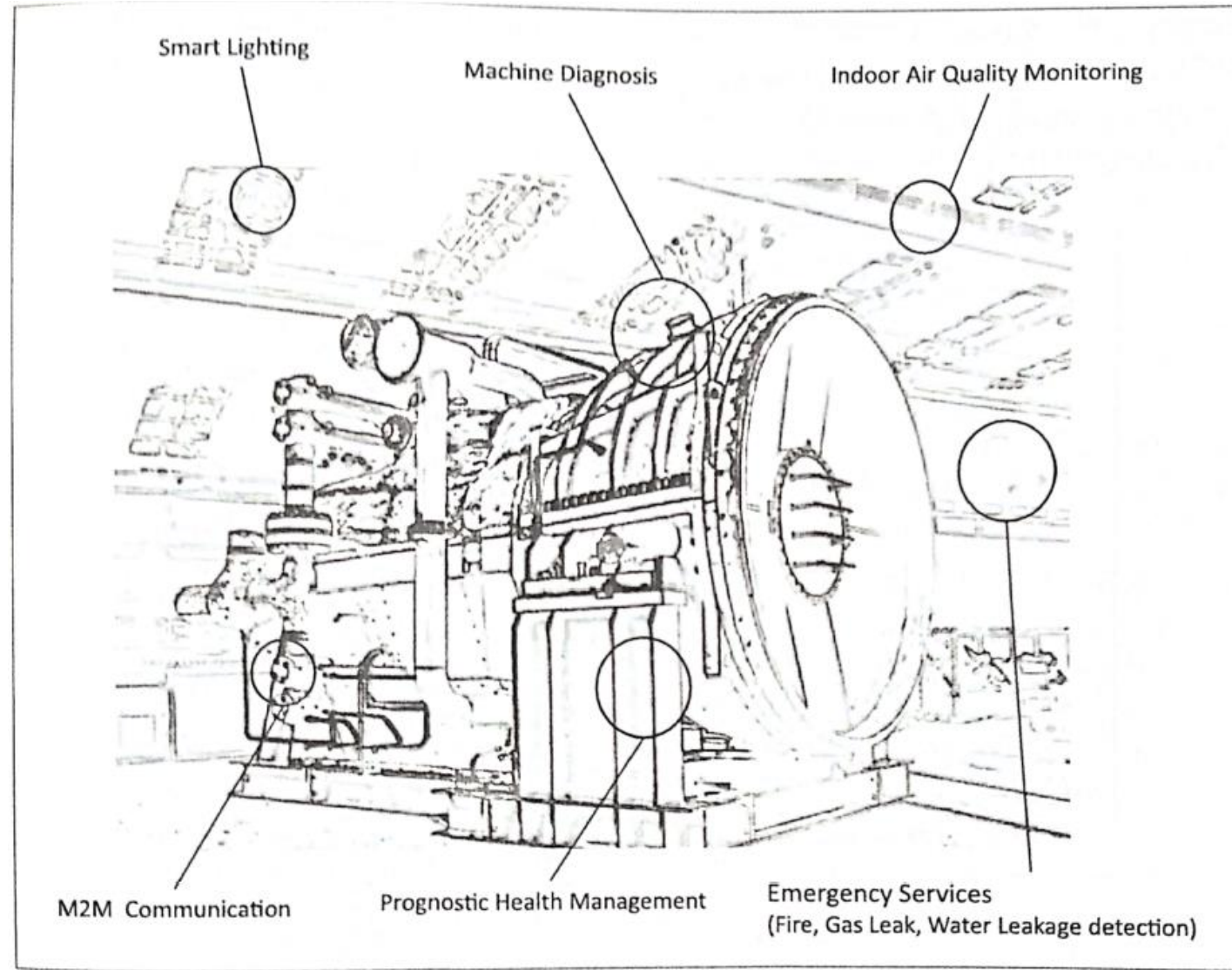
Agriculture (1/2)



Agriculture (2/2)

- Smart Irrigation
 - Use sensors to determine the amount of moisture in the soil
 - Release the flow of water
 - Using predefined moisture levels
 - Water Scheduling
- Green House Control
 - Automatically control the climatological conditions inside a green house
 - Using several sensors to monitor
 - Using actuation devices to control
 - Valves for releasing water and switches for controlling fans
 - Maintenance of agricultural production

Industry (1/2)



Industry (2/2)

- Machine Diagnosis
 - Sensors in machine monitor the operating conditions
 - For example: temperature & vibration levels
 - Collecting and analyzing massive scale machine sensor data
 - For reliability analysis and fault prediction in machines
- Indoor Air Quality Monitoring
 - Use various gas sensors
 - To monitor the harmful and toxic gases (CO , NO , NO_2 , etc.)
 - Measure the environmental parameters to determine the indoor air quality
 - Temperature, humidity, gaseous pollutants, aerosol

Health & Lifestyle

- Health & Fitness Monitoring
 - Collect the health-care data
 - Using some sensors: body temperature, heart rate, movement (with accelerometers), etc.
 - Various forms : belts and wrist-bands
- Wearable electronic
 - Assists the daily activities
 - Smart watch
 - Smart shoes
 - Smart wristbands