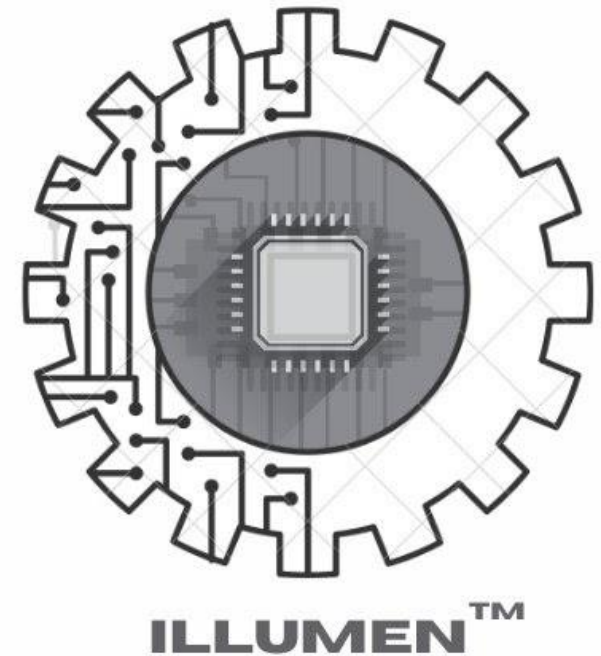


TUM Junge Akademie - Hackathon 2021 OSRAM - UVC Challenge

Team Name: ILLUMEN

Day 3 – Final Presentation



OUR MISSION STATEMENT



Eliminating pathogenic exposure in enclosed spaces.

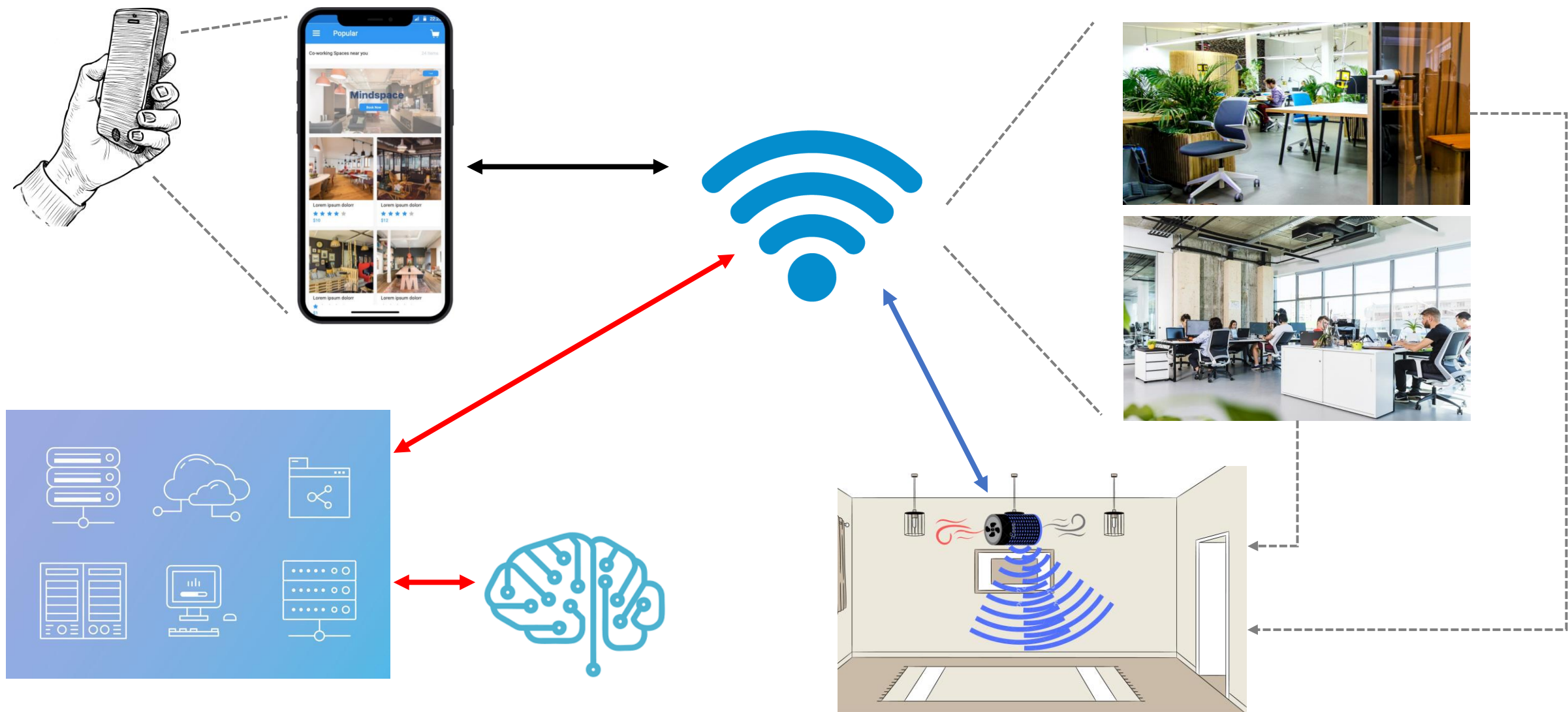


Restoring footfall in commercial spaces.



Reducing 'cleanliness anxiety' from the minds of people.

HIGH LEVEL DIGITAL SYSTEM ARCHITECTURE



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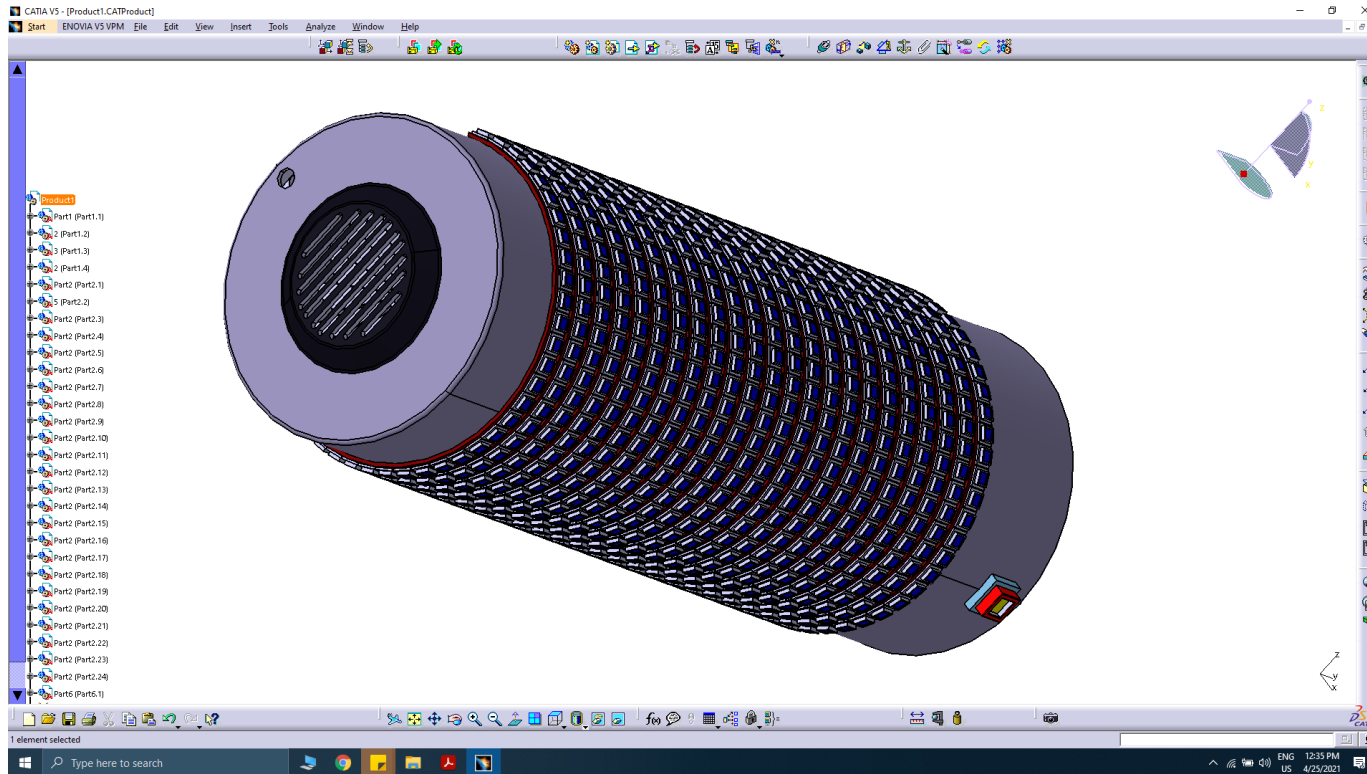
Analytics

Business Case

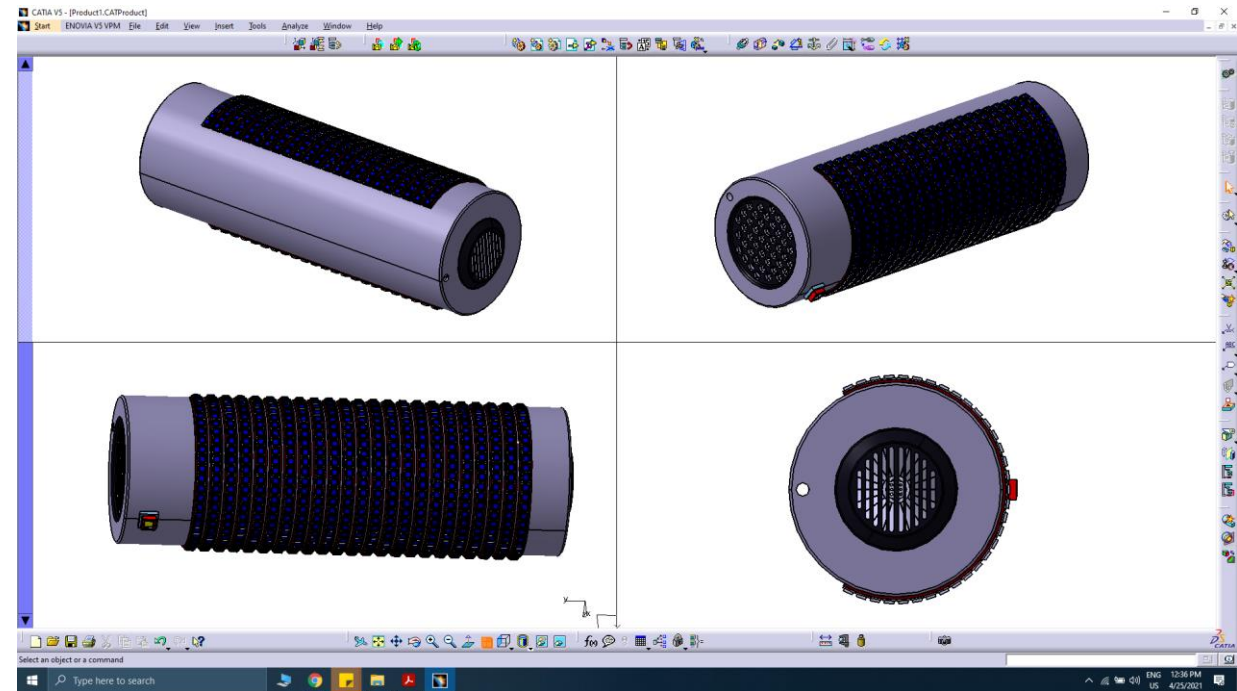
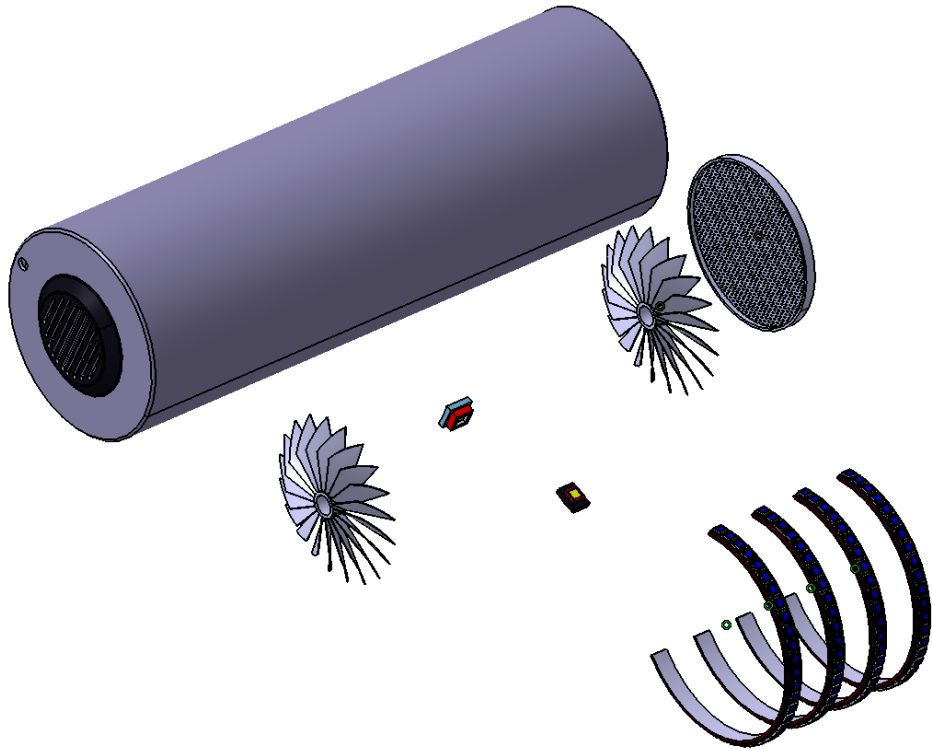
Sustainability

'ILLUMEN' SYSTEM

The building block of our disinfection tech.



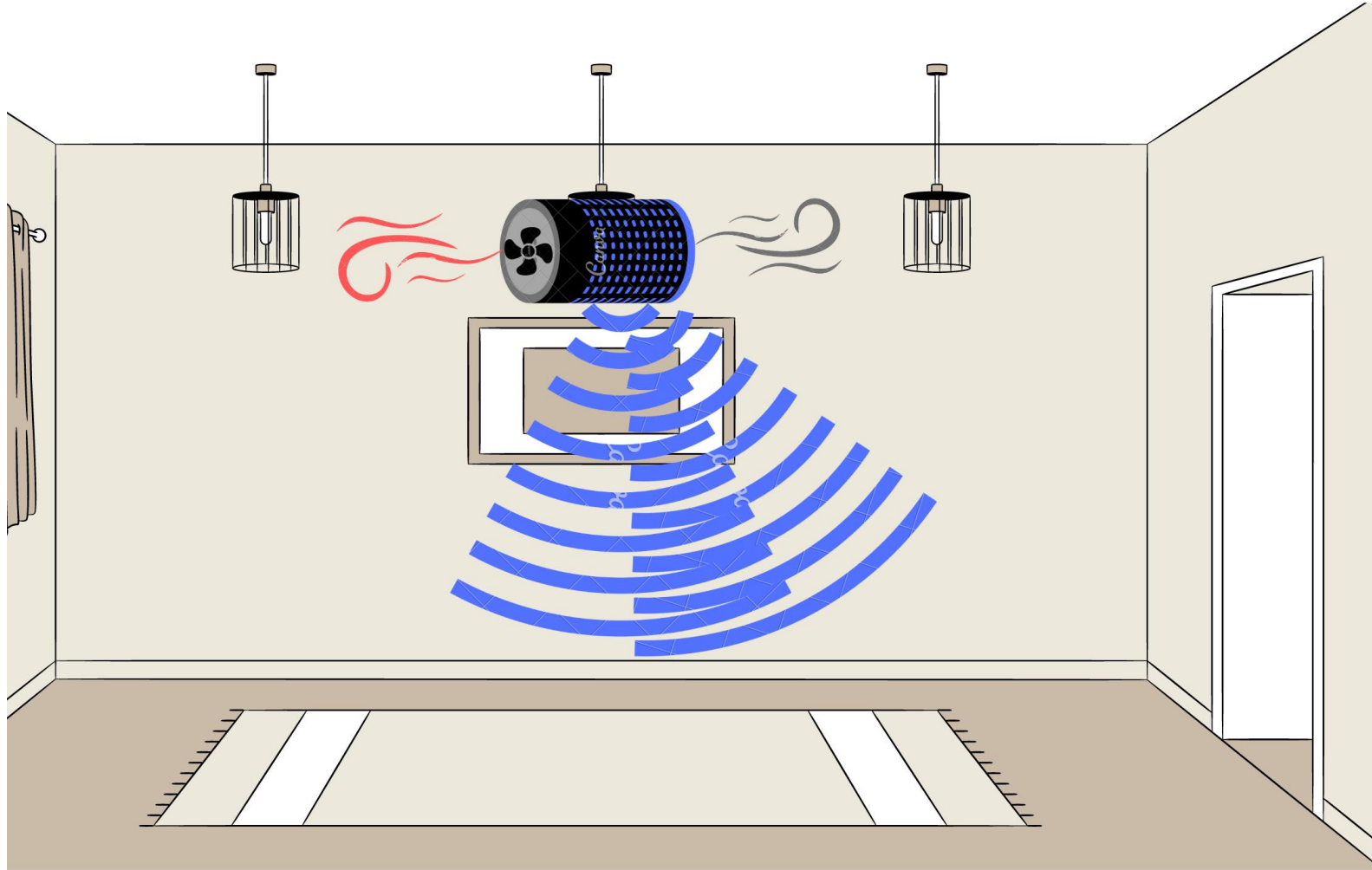
- A 'smart sensor ensemble' coupled with the OSOLON UV LEDs.
- Enhance guided disinfection and real time monitoring of an enclosed space.
- Illumen App offers real time data of spaces and added functionality of customer-bookings (as per customer needs)



'ILLUMEN' SYSTEM: CONCEPTUAL DESIGN SPECS.

Dimensions (diameter x length)	80 x 240 mm
Material	Aluminum and ABS (acrylonitrile-butadiene-styrene)
Surface disinfection	
Exposure time	25-30 minutes.
Number of LEDs	~ 2000
Considered room area	25 m ²
Dosage	300 J m ⁻²
Working Temp. of LEDs	< 50-55 °C
Filter type	HEPA, Activated Carbon (AC)
Air purification	
Air purification capacity	14 m ³ /hr
Dosage	50 J/m ²
No. Of LEDs	1
Running time for entire room purification	3 h
Considered room volume	75 m ³

'ILLUMEN' SYSTEM INSTALLATION IN A CLOSED SPACE



SENSOR SYSTEM ON ILLUMEN

Sensors	Medium	Measured Parameter
UV-A Sensor + Luminometer + Dosimeter	Surfaces + Air	Pathogen Levels
Air Quality Monitor	Air	Air Quality Index
Module pressure, humidity and temperature sensor	Air	Pressure Temperature Humidity
IR/Motion Sensor	Air	Detect moving objects

ANALYTICS

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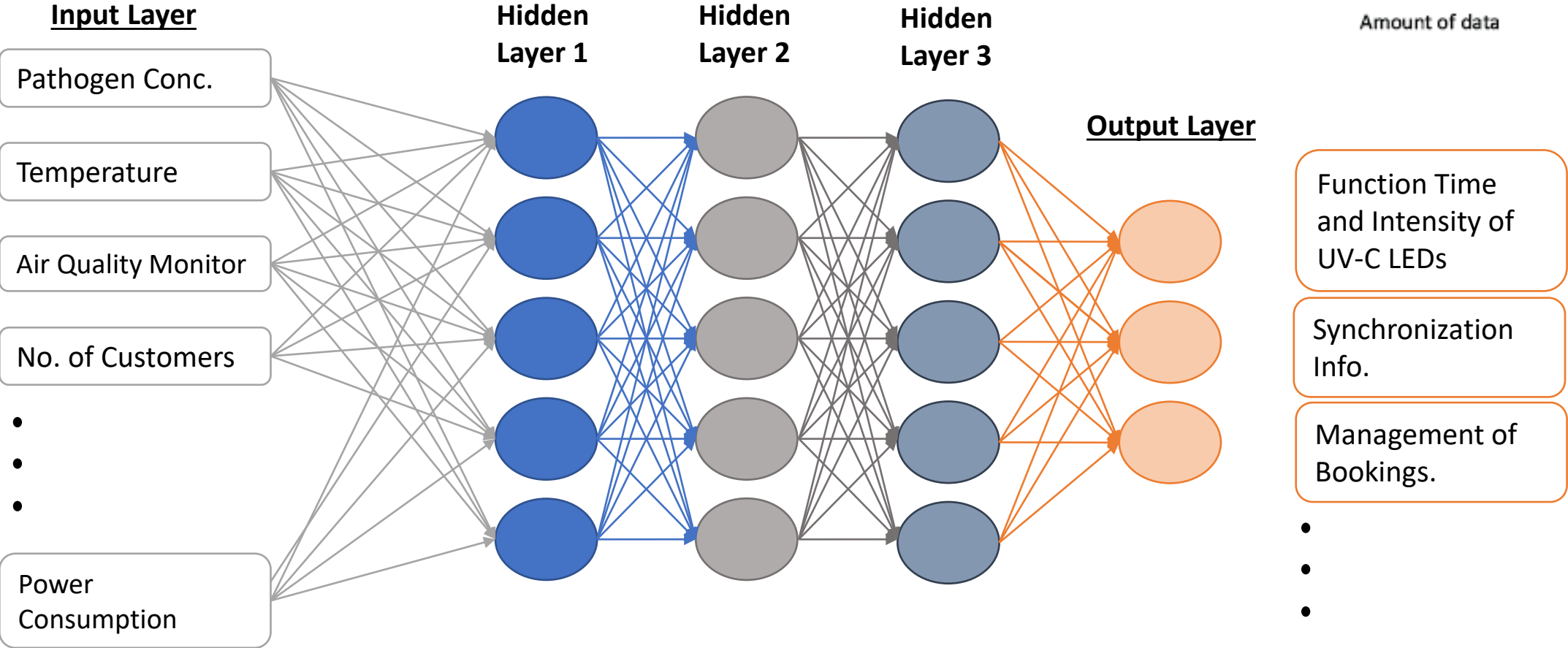
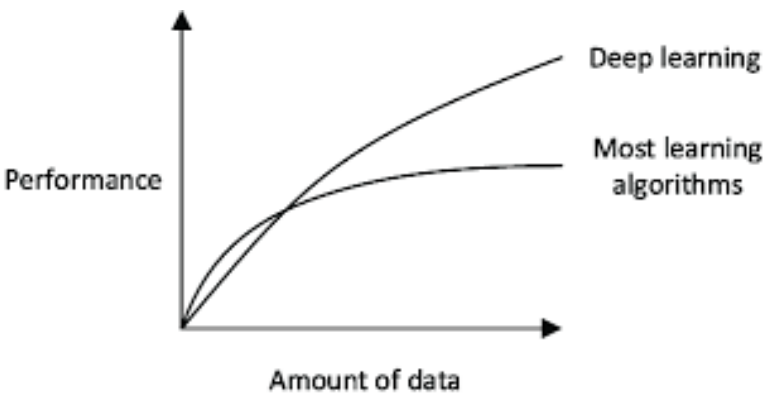
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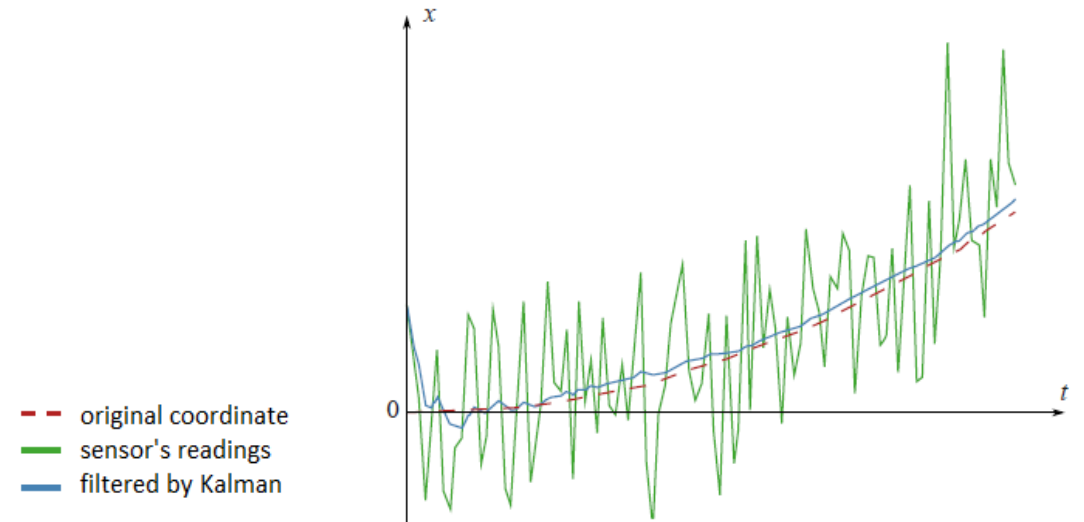
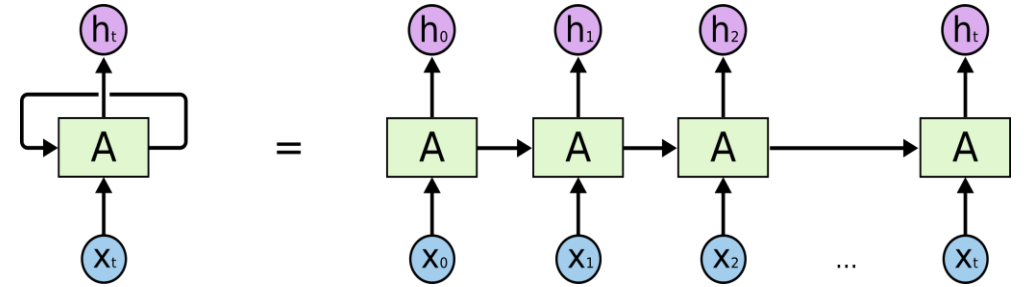
ANALYTICS THROUGH DNNs

Generating value for customers using insights from smart analytics

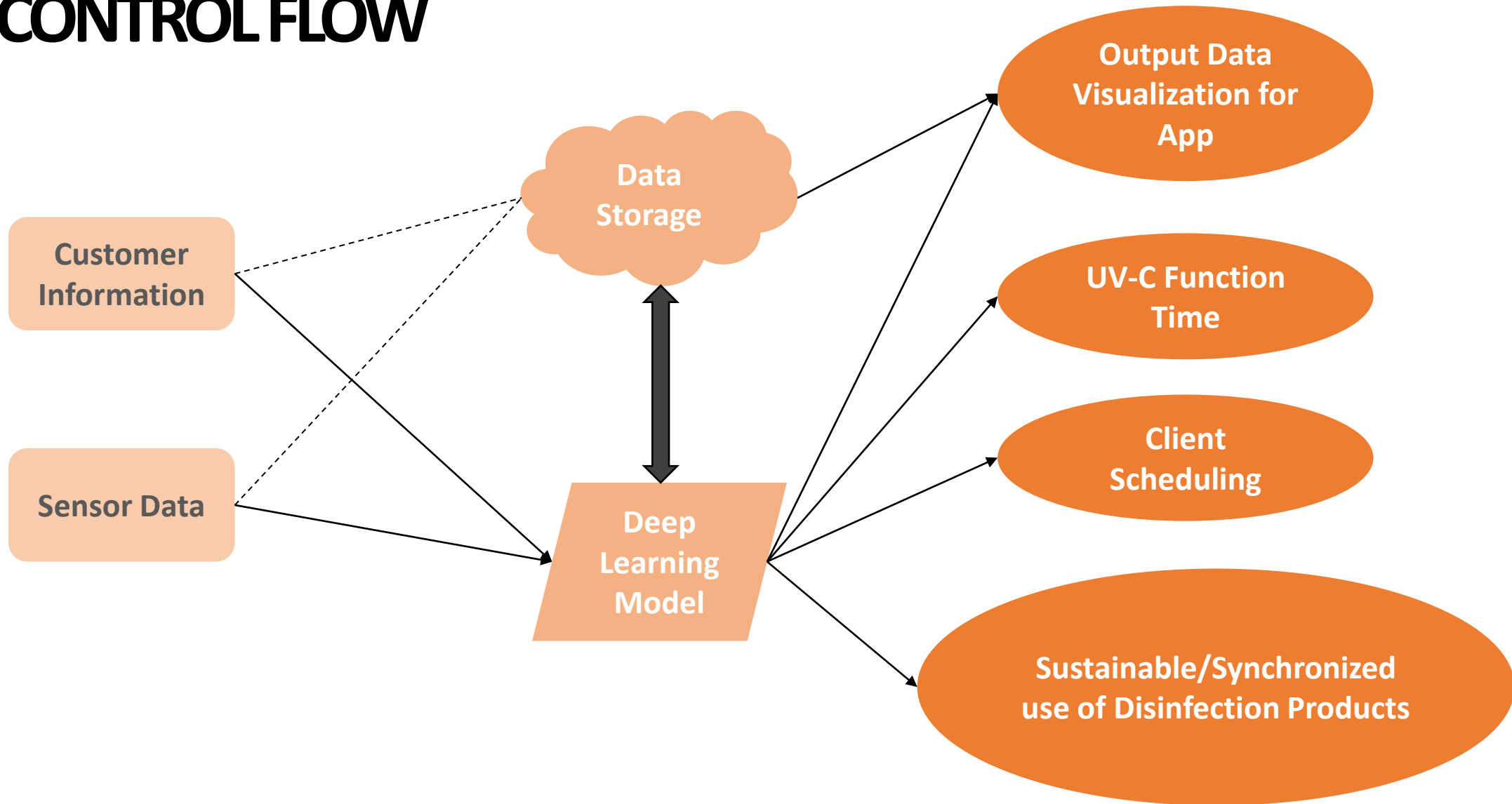


IMPROVING AI INTEGRATION

1. The use of Recurrent Neural Networks can further improve the performance of the deep learning module. The RNN handles time series data smoothly and can give a better inputs for resource management in the long run.
2. The use of Kalman Filters on the output of the sensors provides more stable signals (by filtering out random noise) that can assist the Deep Learning Algorithm to make better predictions. It also synchronizes signals from multiple sensors using Fast Fourier Transforms to improve the generalization of the prediction.



CONTROL FLOW



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SYSTEM INTEGRATION AND SIMULATION

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App Integration

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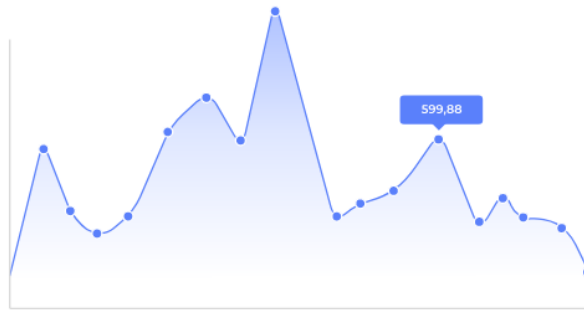
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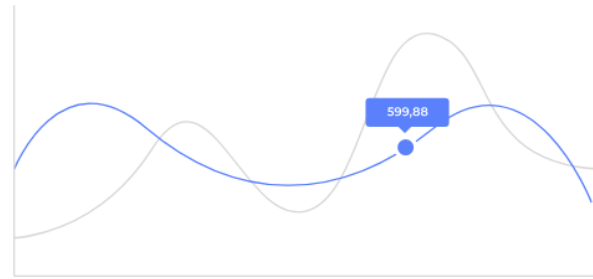
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ANALYZING GERM PROTECTION

The analysis of various pathogens in the air and on surfaces is done using UVA sensor technology and luminometer technology, which can be mapped on the graph.



AIR QUALITY MONITORING

Many germs transfer via air. Hence, air purification and disinfection is important. Air quality monitoring enables real-time output of various gases, and overtime removes all the toxic gases.

- ☒ Disinfection Smart-Lock
- ☒ Active Thermal Control
- ☒ Integrate with Google Calender

DATA STATISTICS

PM 2.5
10

UVC
-99%

Humidity
40%

Temp
26*

BUSINESS CASE

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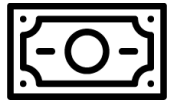
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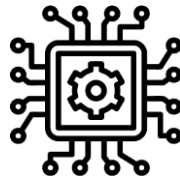
Sustainability

A CUSTOMER PERSPECTIVE

How can customers benefit from this business model?



You are relieved
from high upfront
costs



We provide and
install the necessary
hardware



We provide
monitoring and
visualization
software



We maintain the
whole system



Together, we make
your business safer

SOLVING THE PROBLEM PROACTIVELY

Using **COVID-19** as an **opportunity** to strengthen Osram

VALUE PROPOSITION

- 1 Providing **pathogen safety** by UV-C disinfection as a service
- 2 Creating **trust** in our customer's commercial spaces
- 3 Enabling an increase in social interaction during epidemics and pandemics
- 4 Reducing **pathogen load** in contaminated places

BACKEND

Key Activities

Installing and maintaining UV-C disinfection hardware and sensors

Key Partners

Digital Lumens, the users of the spaces, i.e., the customer's customers

Costs

Manufacturing and installing hardware

Key Resources

UV-C lamps/LEDs and sensory devices

FRONTEND

Revenue streams

Subscription based monthly payments that lock in the customers

Customer Relationships

Osram as a competent full-service provider that customers can rely on

Customers

Commercial spaces (Malls, Restaurants, Hotels, Coworking spaces...)

Channels

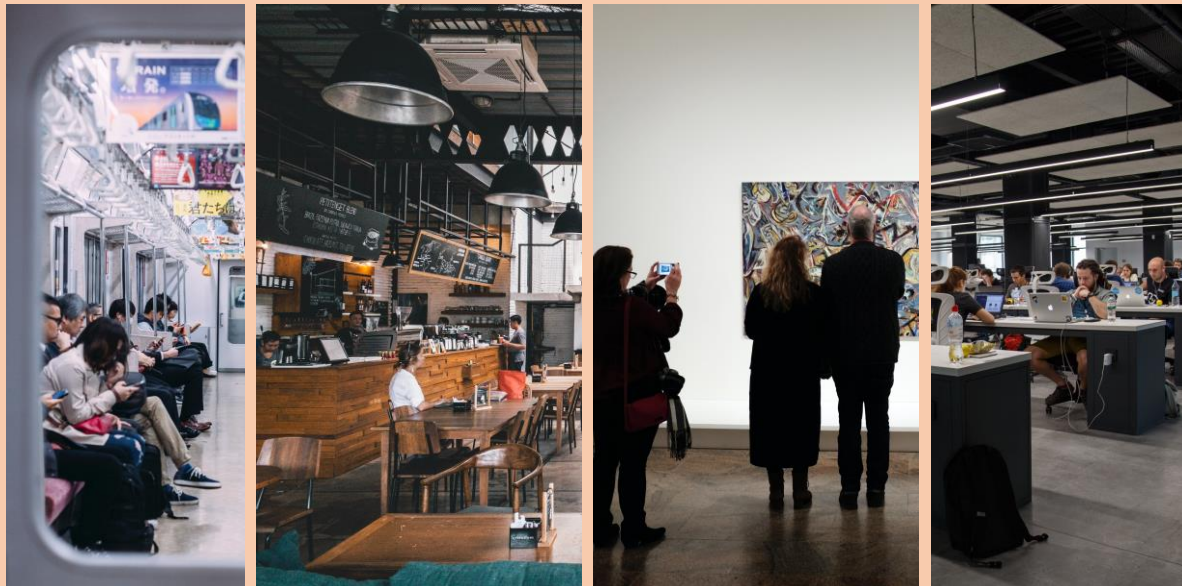
B2B marketing that based on the relationships to Osram's customers

USE CASES

Where might these UV-C disinfection products be applied?

Pathogens are **everywhere**.

A complete, interconnected, interactive system of pathogen **safety** and **monitoring** based on UV-C disinfection can be of use to almost anyone at almost any place

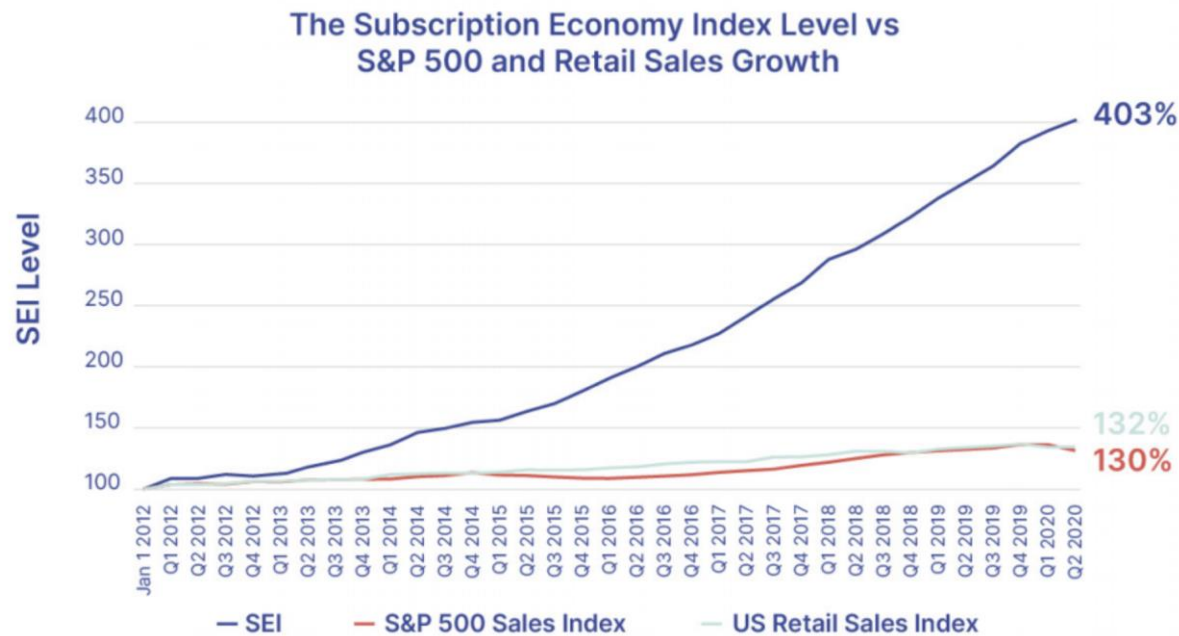


LIMITATIONS

- 1 Safety:**
Complete sterilization of pathogens **cannot be guaranteed**
- 2 Monitoring:**
Impossibility of continuously and accurately **measuring pathogen load** in the air, limits the monitoring
- 3 Procurement:**
Vulnerability towards COVID-19-induced supply chain disturbances is still in place
- 4 Cost Viability:**
Forecasting the **cost reduction** in the production of UV-C LEDs is troublesome

FEASIBILITY

Is such a subscription-based business model feasible?

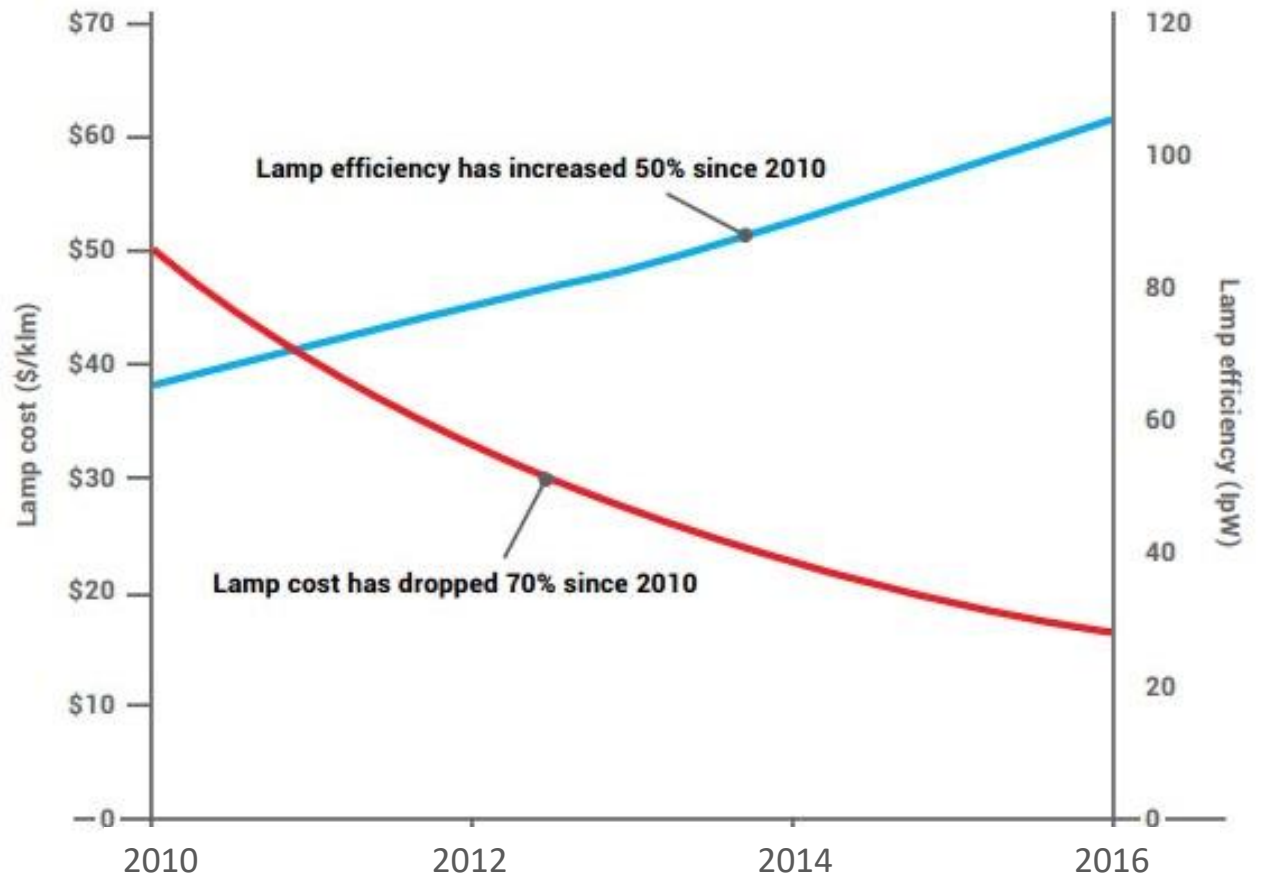


Arguments

- 1 By selling a service that **customers trust in**, it is ensured that **they do not switch** to cheaper substitute products
- 2 **Savings** due to decreases in production cost of hardware **remain at Osram** for a longer time
- 3 Osram has **full control** over the whole system and can **leverage the collected user and sensory data** for future products and services
- 4 Osram **already has expertise** in connecting light technology with IOT due to the acquisition of Digital Lumens

THE FUTURE

Switching from fluorescent UV-C light sources to UV-C LEDs



Source: Goldman Sachs Investment Research

What history tells us...

- 1 LED technology has become a **lot cheaper**
- 2 The same will probably be true for **UV-C LEDs**

What this means for the business Model...

- 3 It can be introduced using current **fluorescent UV-C lamps**
- 4 UV-C LED-based products can be introduced into the system **gradually**

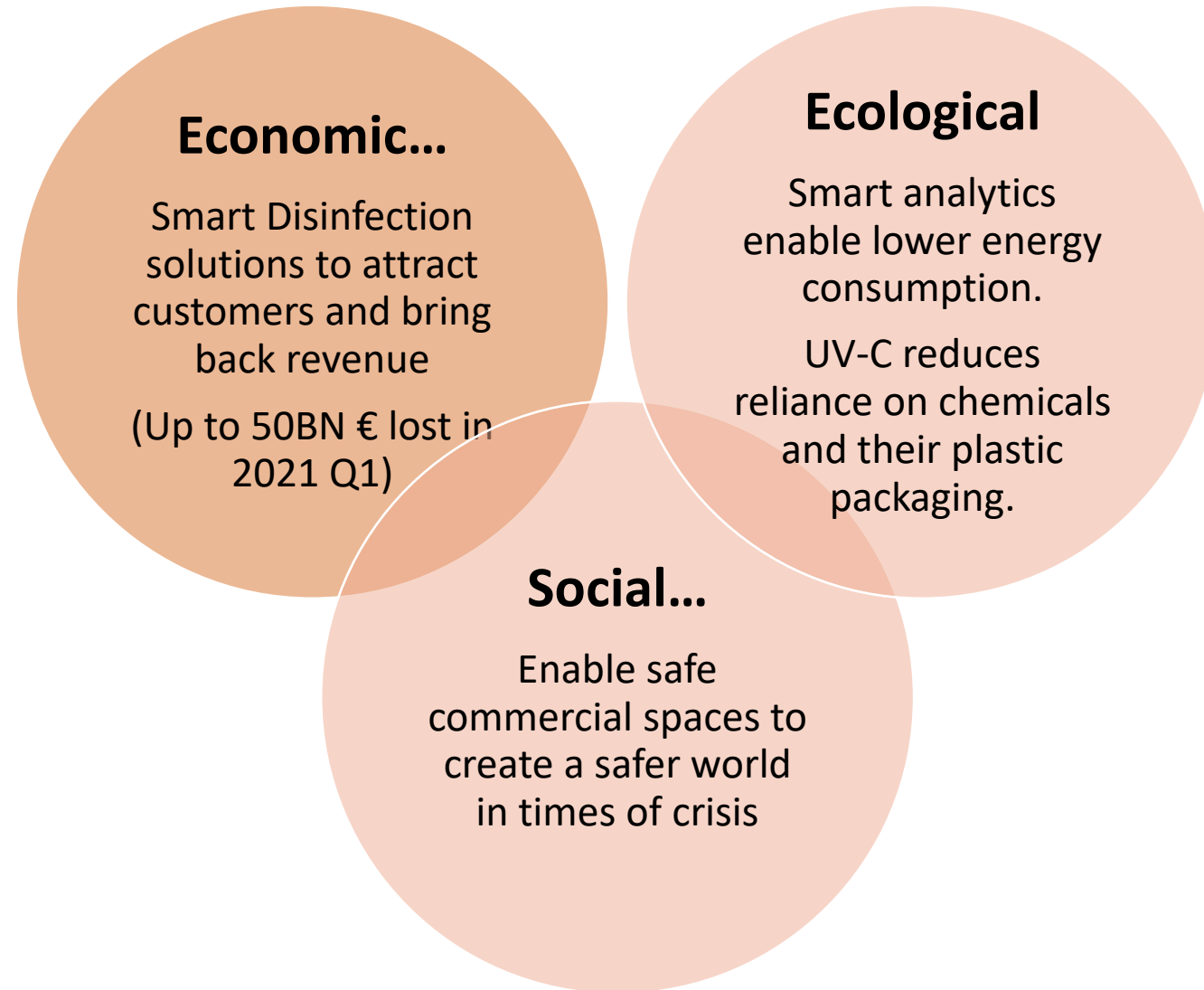
EFFECT: Osram may use the cheapest technology available at any time

TECHNOLOGY COMPARISON

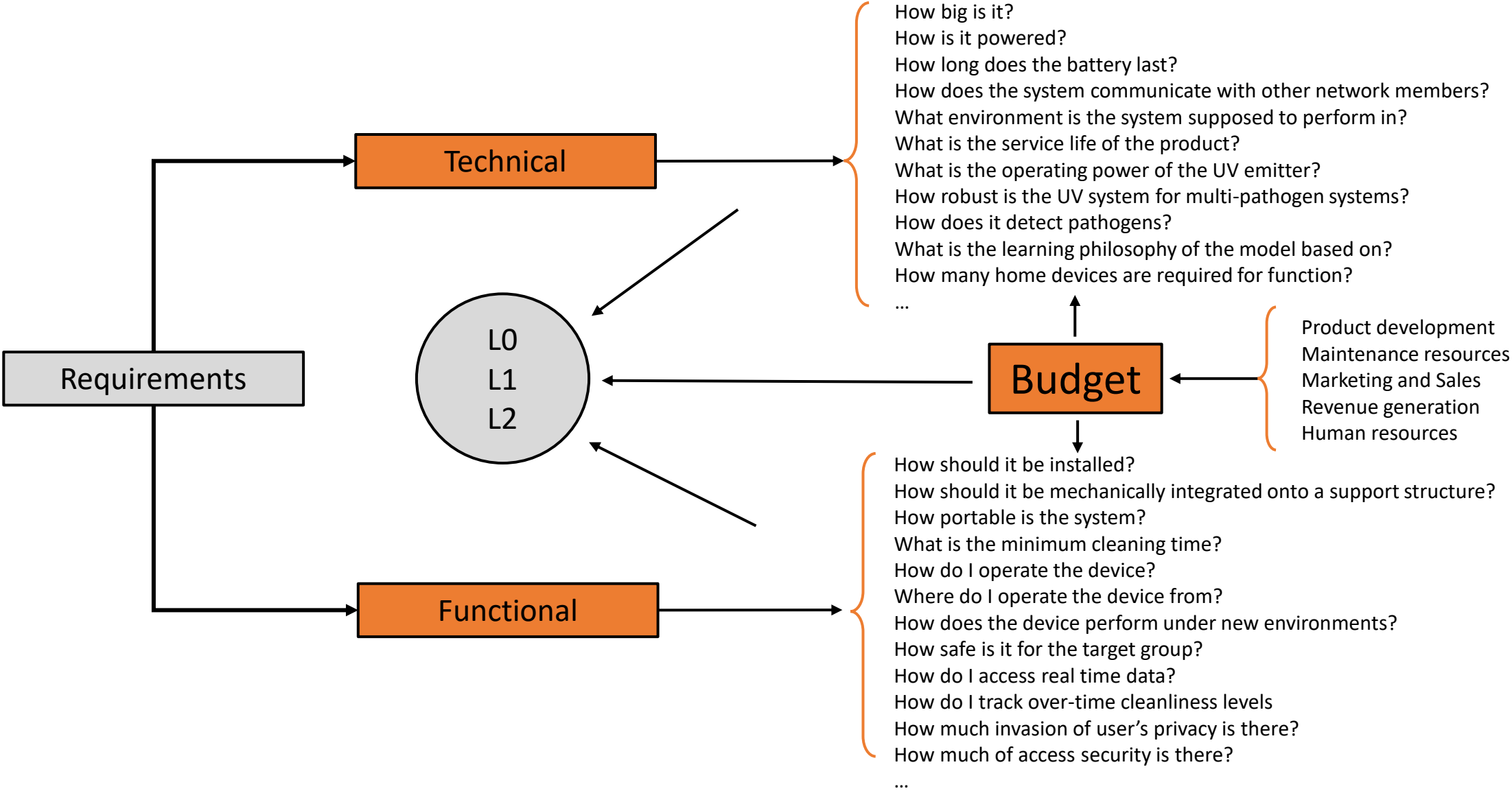
The comparison chart shows how Illumen Technology is differentiated from the current available disinfection technologies in the market.

	TRADITIONAL	ILLUMEN
Zero Ozone Emissions	✗	✓
AI+App Integration	✗	✓
Upfront + Maintenance Costs	✓	✗
Subscription-Based	✗	✓
IoT Features	✗	✓
Higher Efficiency	✗	✓

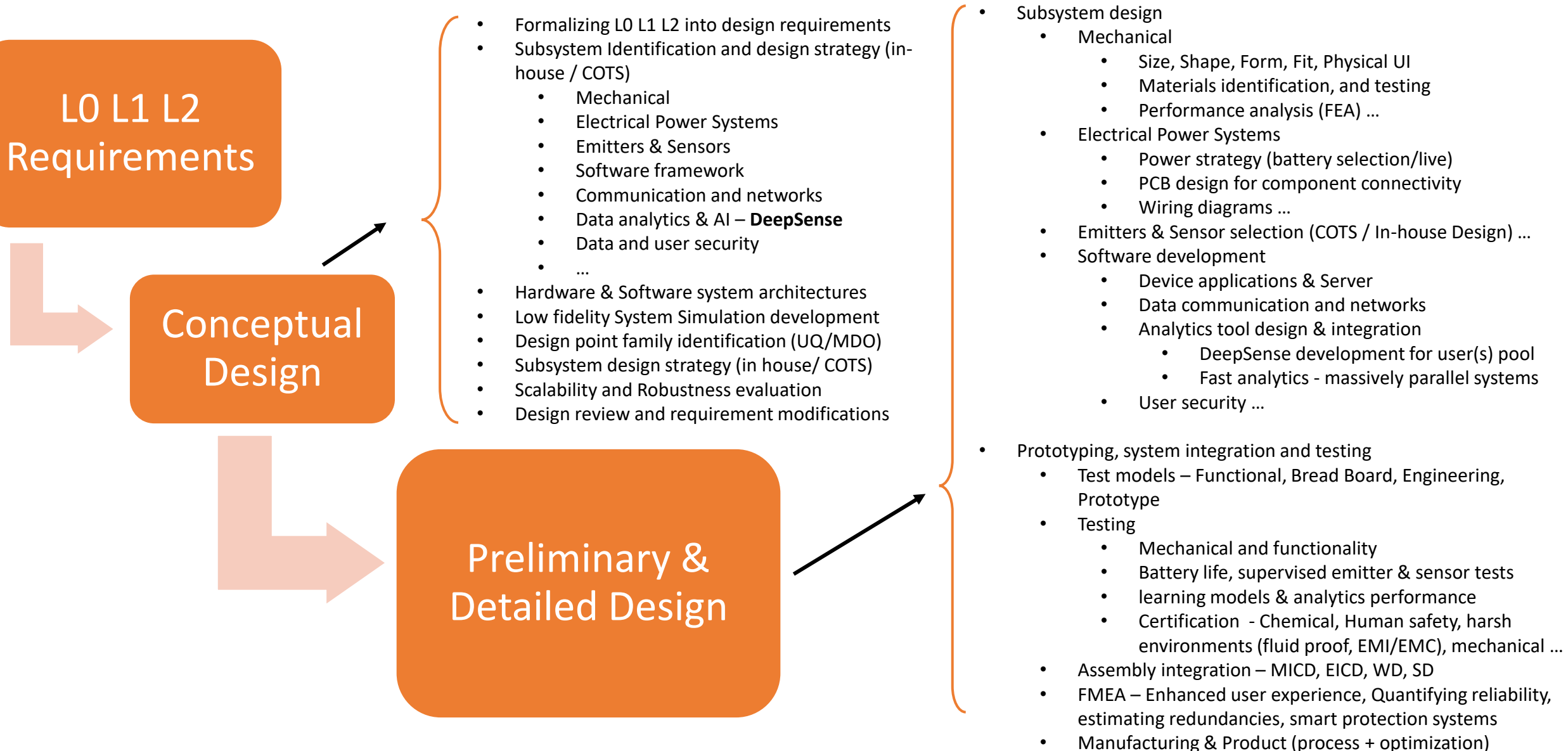
A NOTE ON SUSTAINABILITY

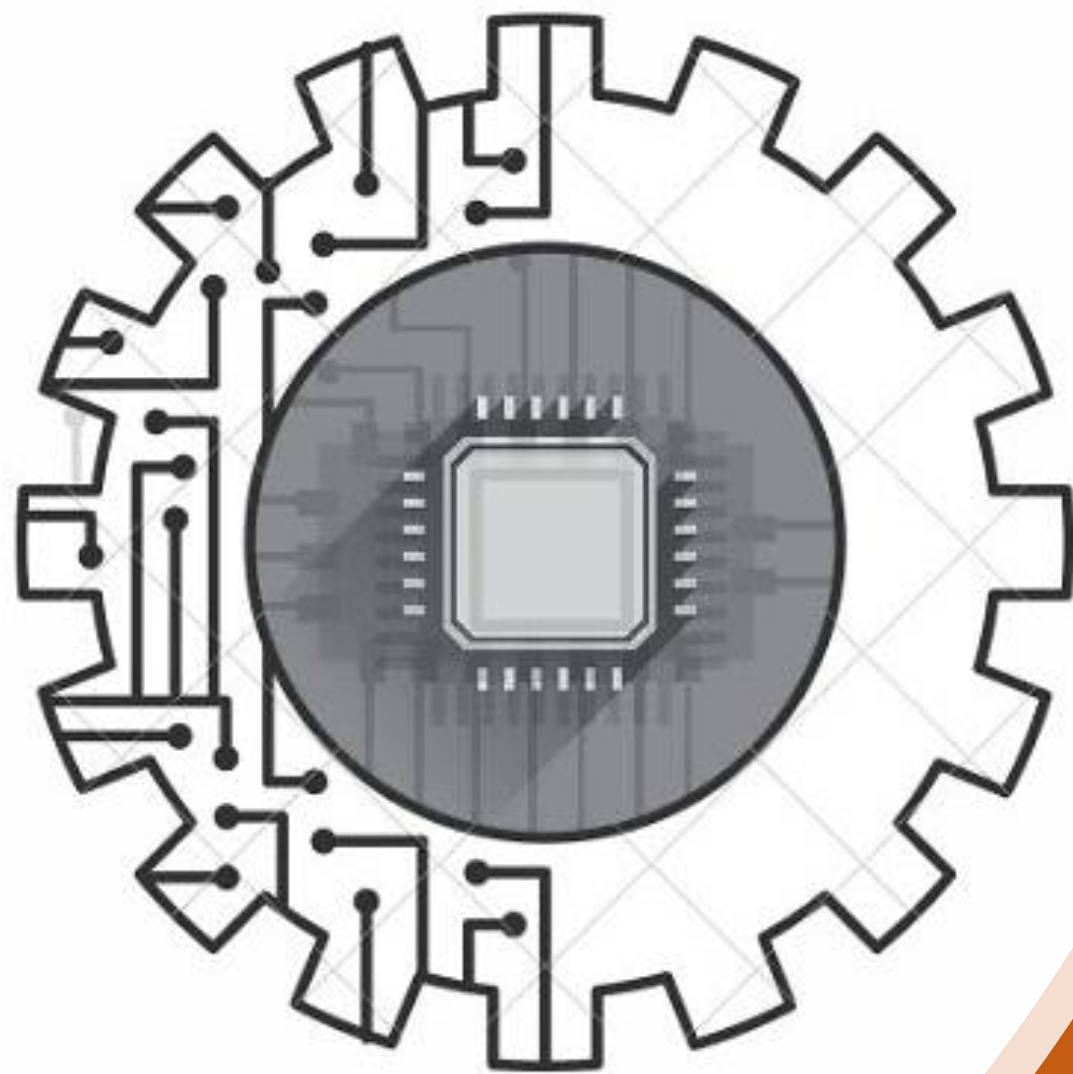


Next Steps: Product Design Philosophy – Digital Aided Cleansing



Next Steps: Product Design Philosophy – Digital Aided Cleansing





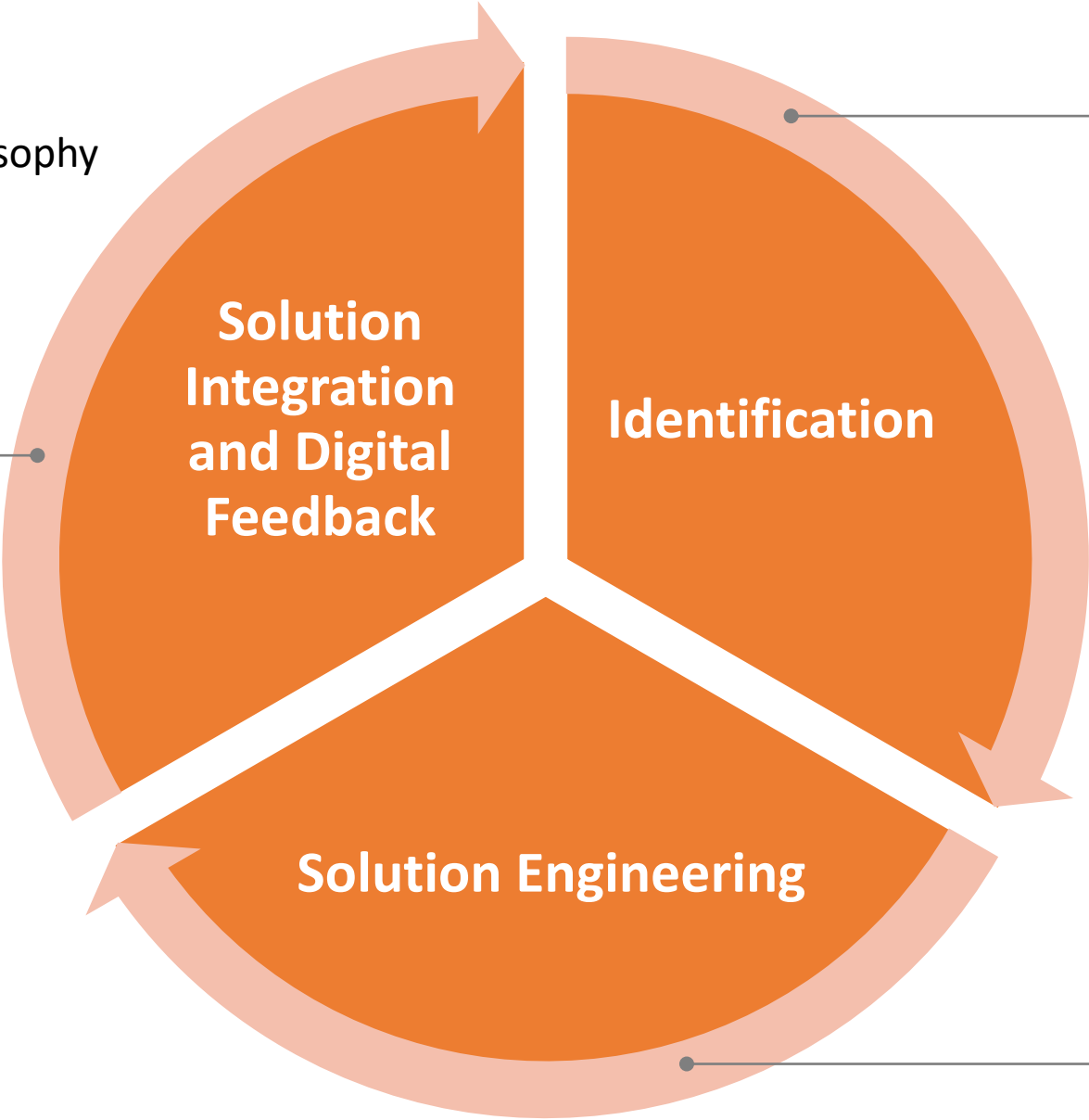
ILLUMEN™

Thank you

OUR TECH

Technology Design Philosophy

Data processing
Pathogen maps
Data relay through IoT



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