Team 510: Indoor Air Quality of Hotspots

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Eric Grogans, Leon Johnson, Emma Martin, Razhan Matipano, Whitley Pettis

Team Introductions

Eric Grogans
Electrical Engineer

Leon Johnson
Test Engineer

Emma Martin
Project Manager

Razhan Matipano
Research/ Manufacturing Engineer

Whitley Pettis
Manufacturing Engineer

Razhan Matipano

FAMU-FSU
Engineering

Sponsor and Advisor

Honeywell

FAMU-FSU College of Engineering

Engineering Mentor
Danny White
Honeywell

Engineering Mentor
Lauren Cobb
Honeywell

Academic Advisor
Neda Yaghoobian, Ph.D.
Professor

Senior Design Professor
Dr. McConomy, Ph.D.
Professor

Razhan Matipano

Objective

The objective of the project is to improve air quality in the FAMU-FSU College of Engineering. This is motivated by the negative effect that indoor air pollution has on individuals.

Razhan Matipano

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Engineering

Project Background
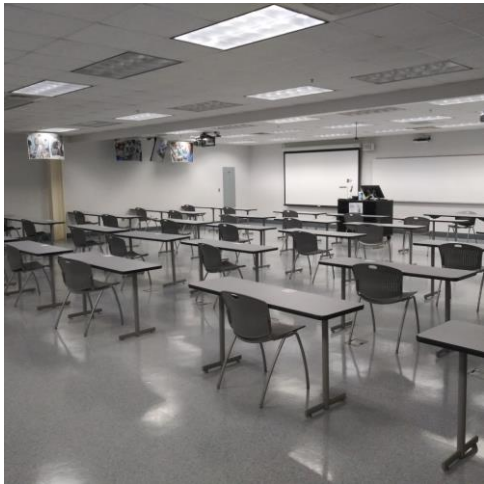
Razhan Matipano

FAMU-FSU College of Engineering

→ Approximately 2,500 students enrolled

→ Approximately 160 faculty members
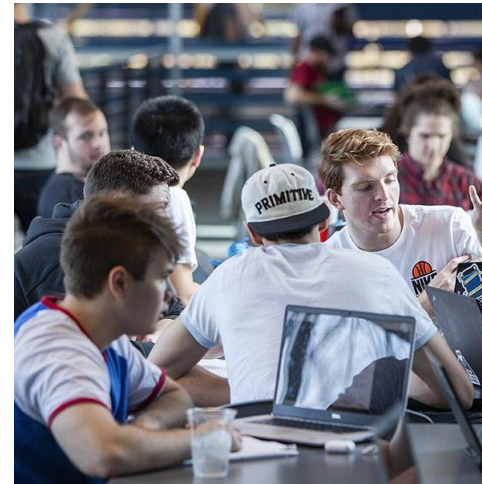

Sourced: famu.edu

Razhan Matipano

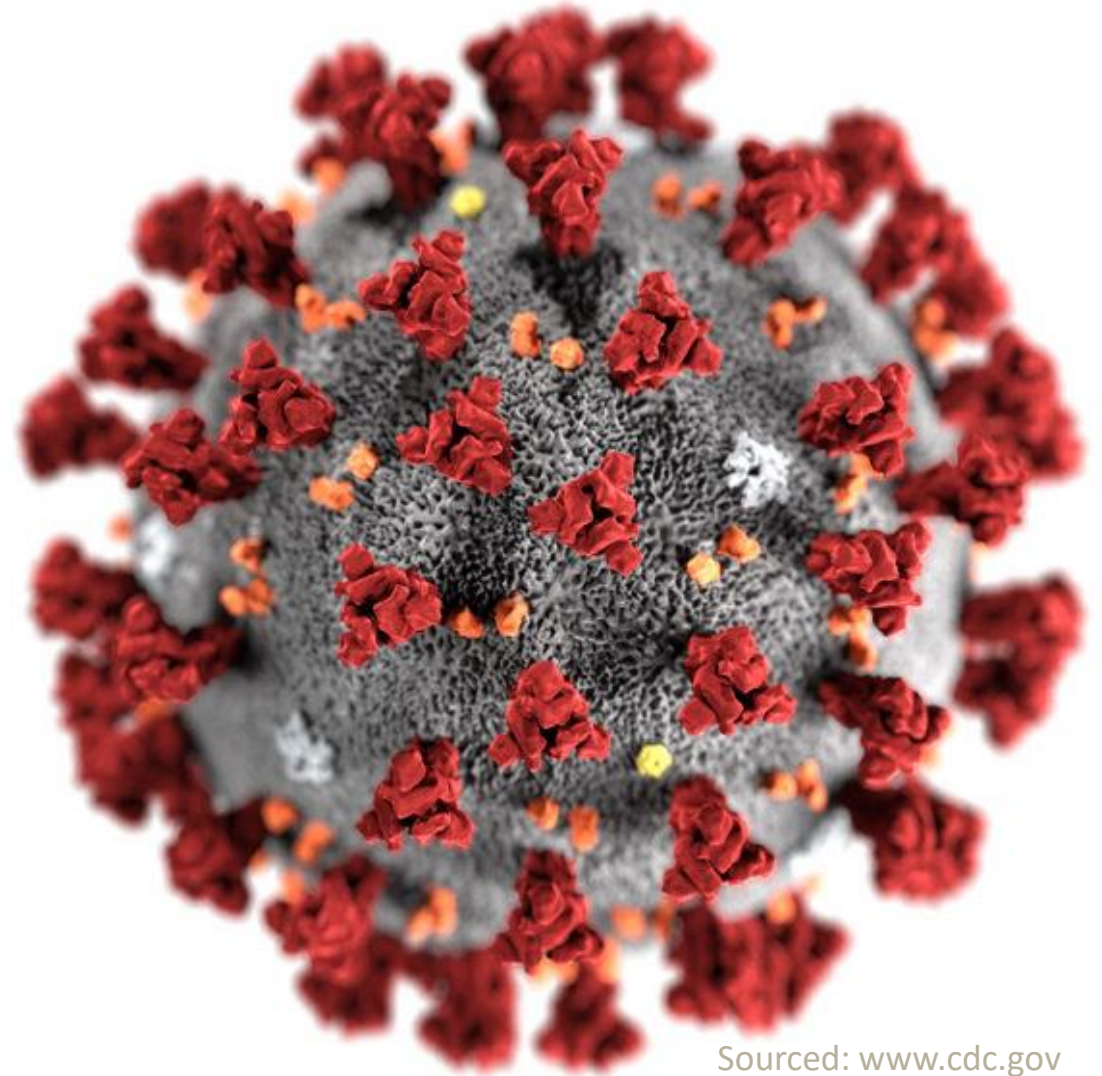# FAMU-FSU College of Engineering

Classrooms

Laboratories

Study Spaces

Offices

Razhan Matipano

Department of Mechanical Engineering
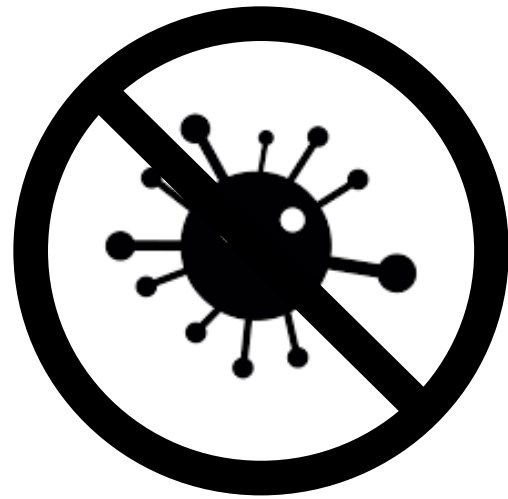
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COVID-19

→ Caused by the pathogen SARS-CoV-2

→ Carried by respiratory droplets in air

→ Air quality is especially important

Sourced: www.cdc.gov

Razhan Matipano

FAMU-FSU
Engineering

Key Goals

Improve air quality in public spaces

Decrease presence of pathogens

Improve user experience and safety

Razhan Matipano

Primary Market

Honeywell

FAMU-FSU Engineering

Secondary Market

Homeowners

Commercial Buildings

Schools

Public Transportation

Razhan Matipano

FAMU-FSU Engineering

Assumptions

→ Works with existing Honeywell products and software

→ Will not use a proprietary power source

→ Will be compatible with existing building infrastructure
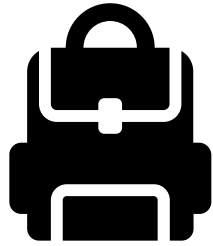
→ Will require general maintenance

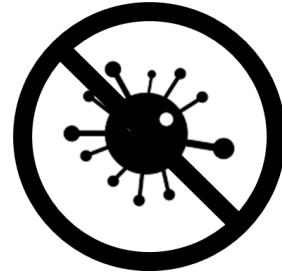Razhan Matipano

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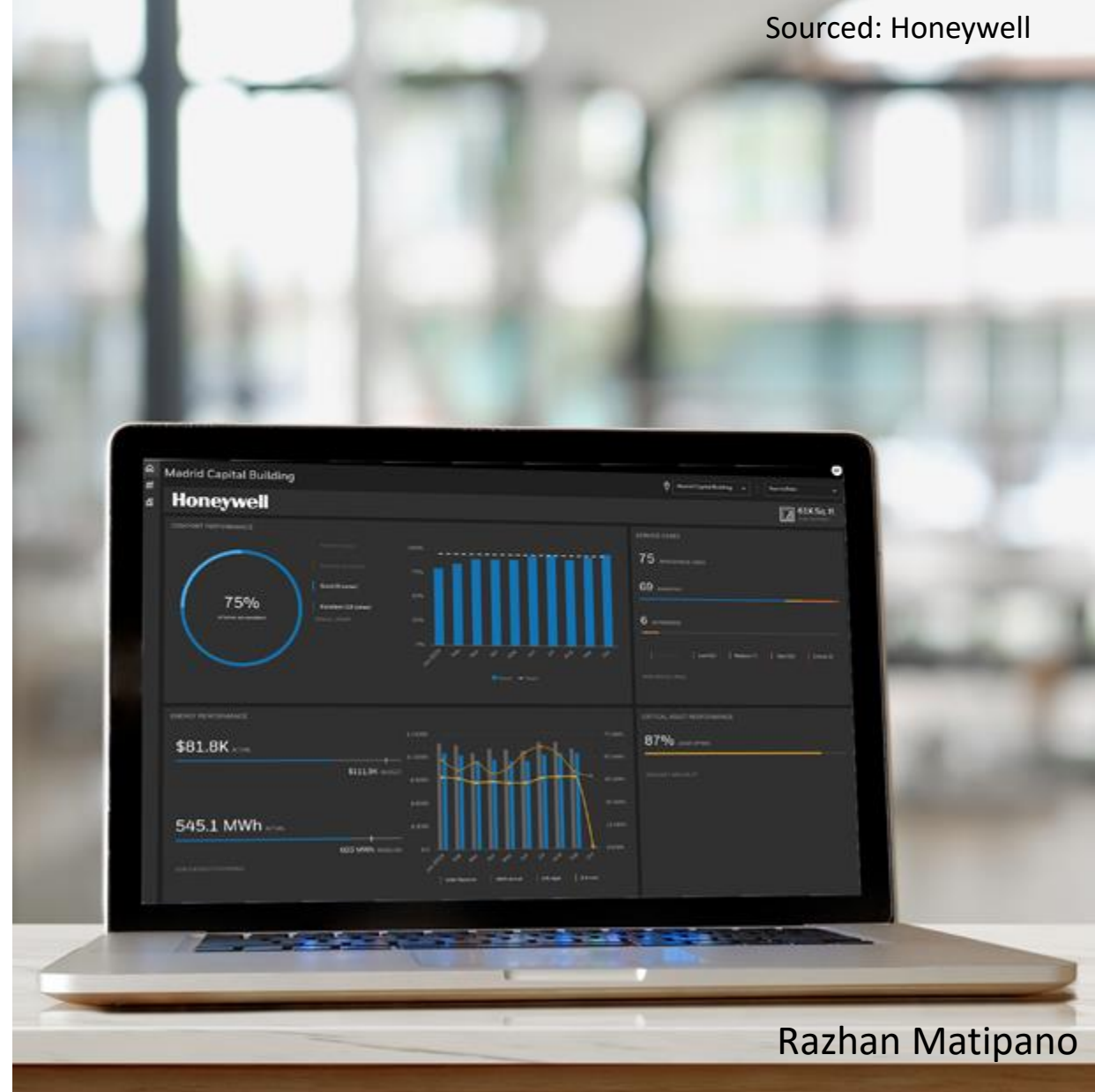
Customer Needs and Functional Decomposition

Whitley Pettis

Customer Needs
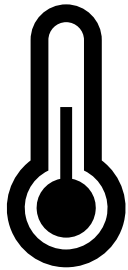
Portable
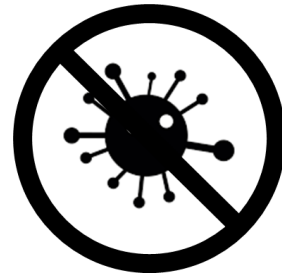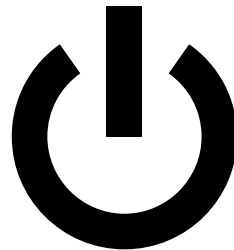
Reduces
Contamination

Limited
Volume

Limited
Heat

Internal
Power Source

Monitors
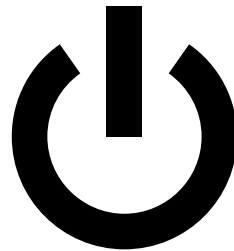Air Quality

Whitley Pettis

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Customer Needs

Portable

Reduces
Contamination
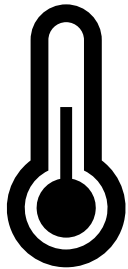
Limited
Volume

Limited
Heat

Internal
Power Source

Monitors
Air Quality

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Functional Decomposition

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Functional Decomposition

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Functional Decomposition

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Functional Decomposition

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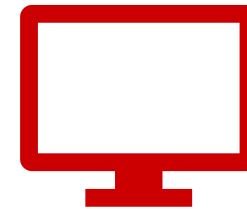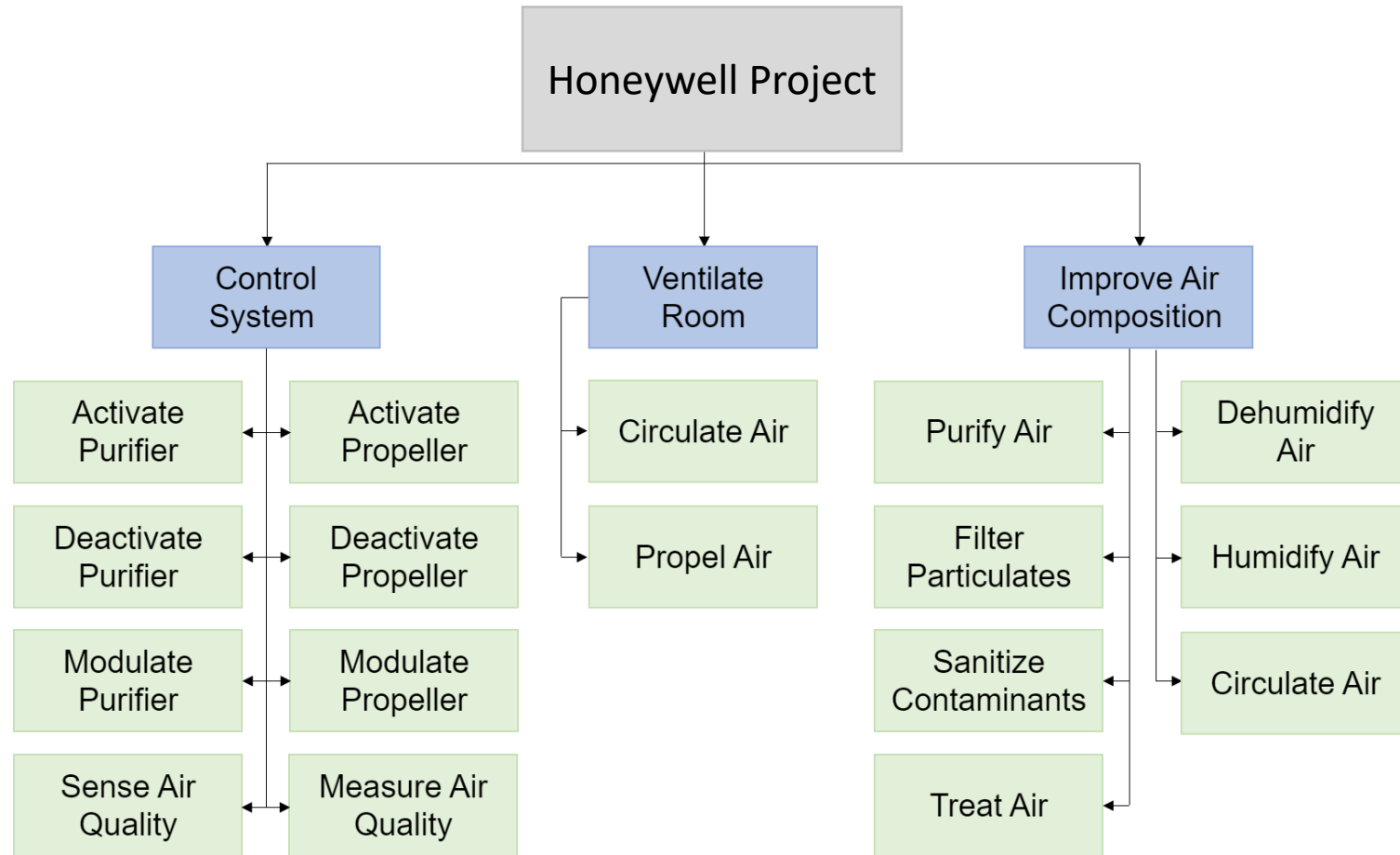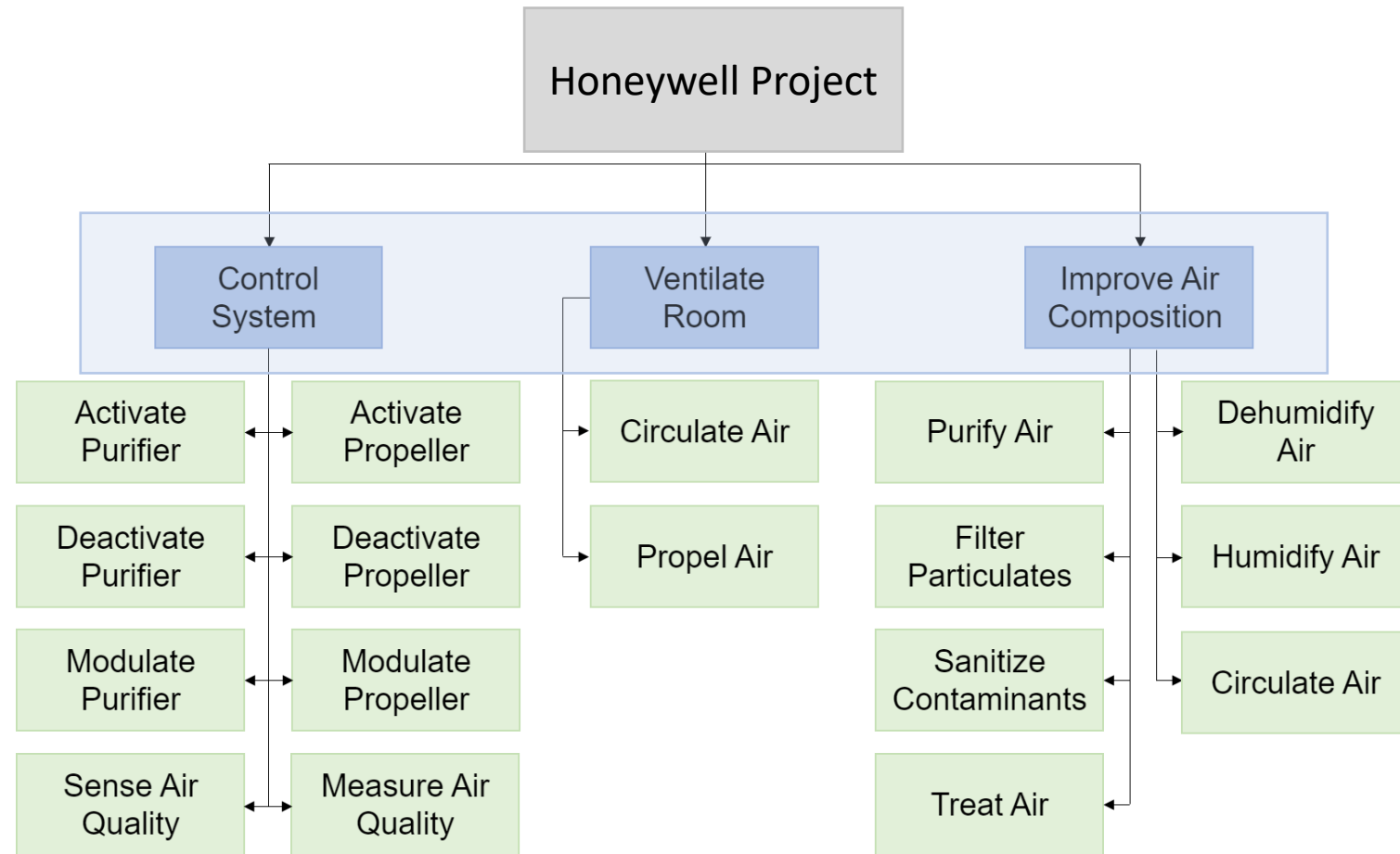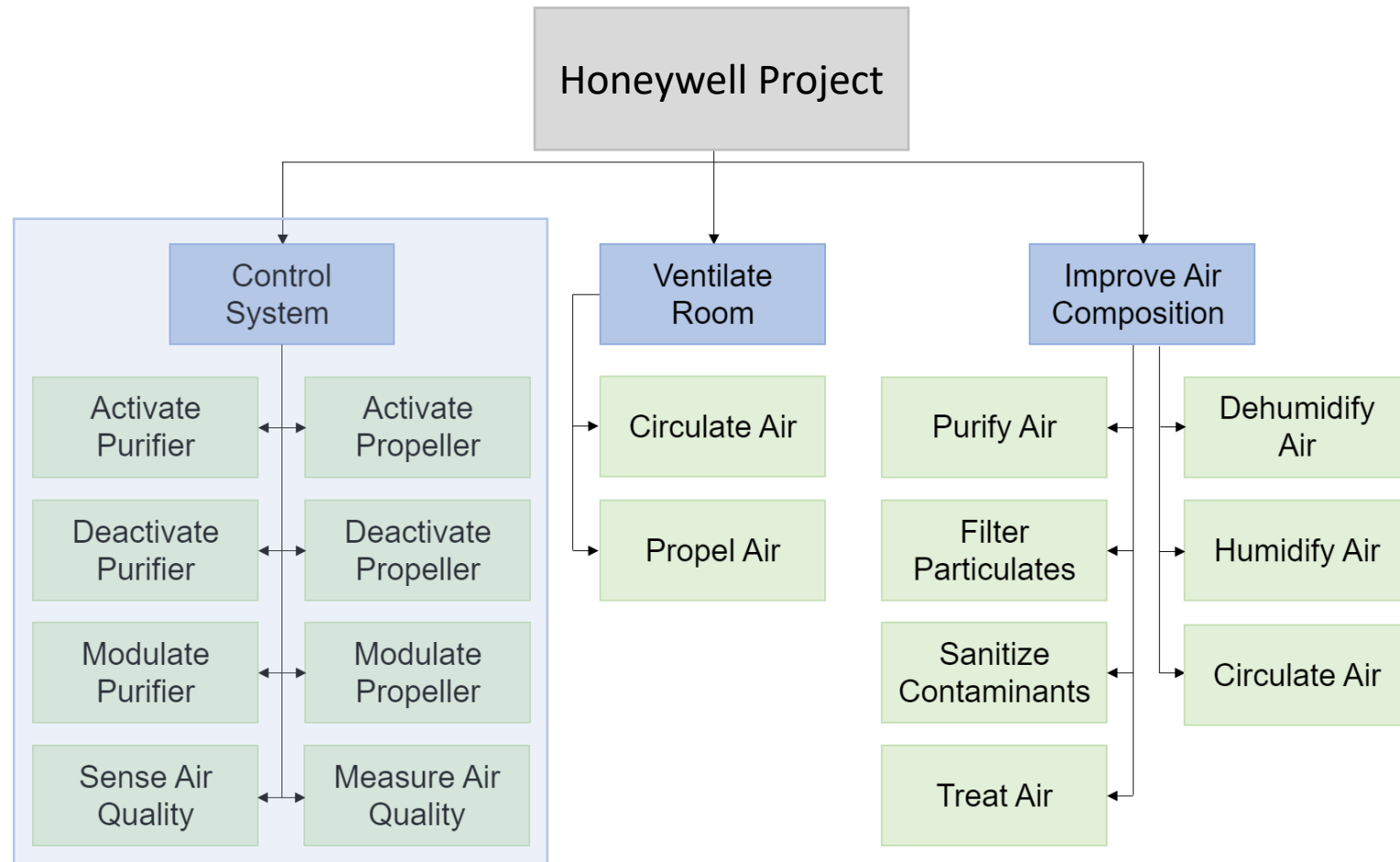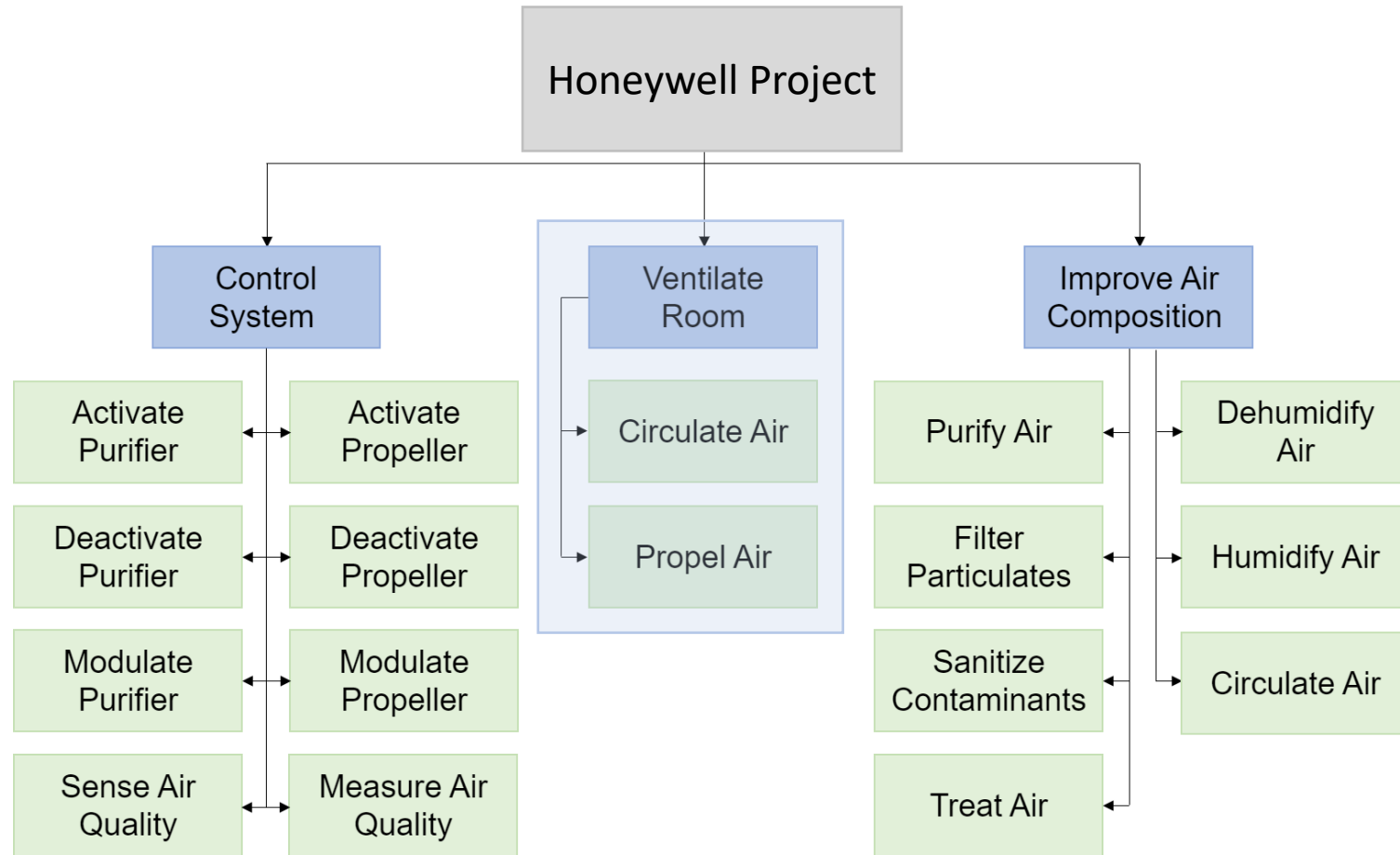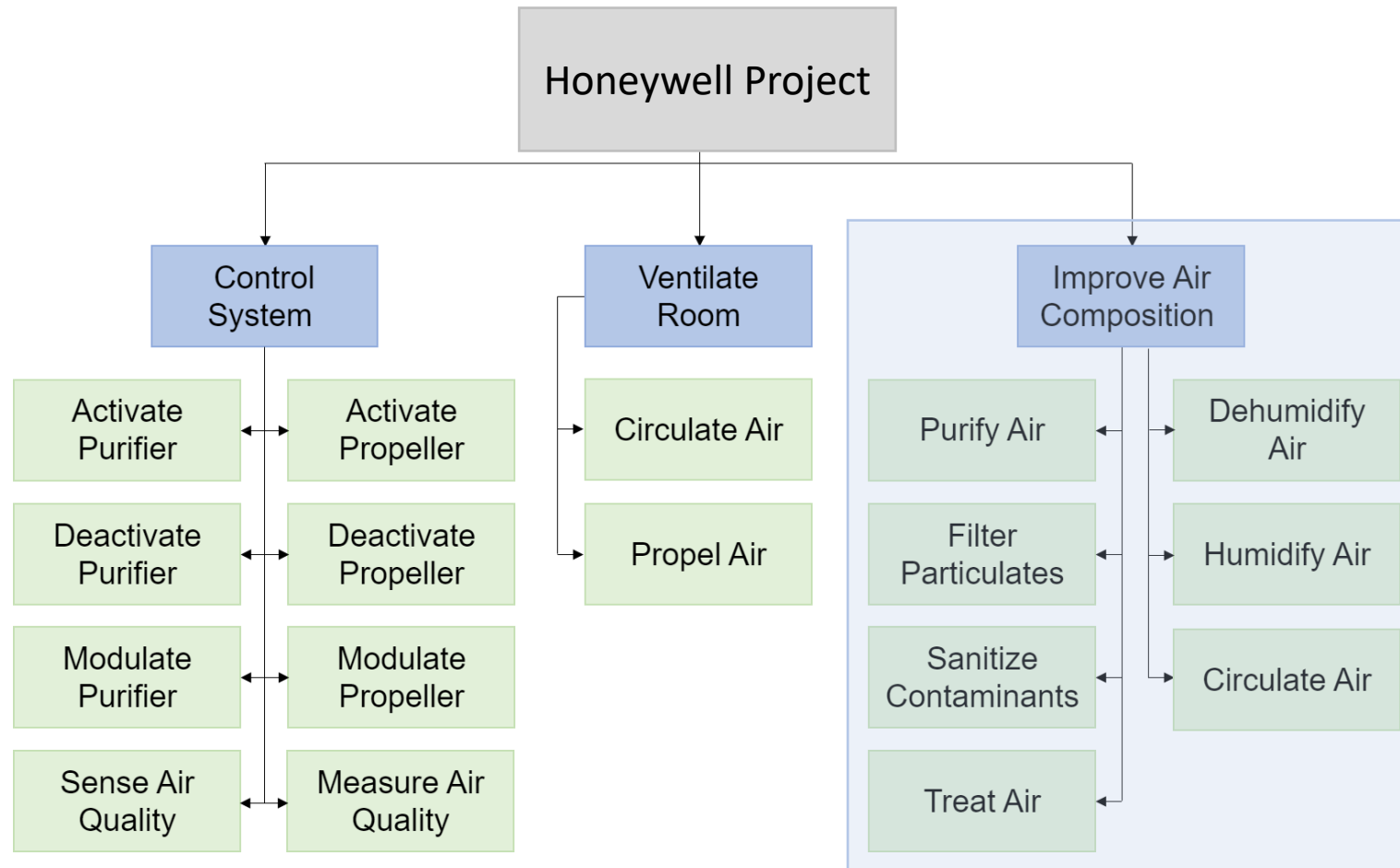
Functional Decomposition
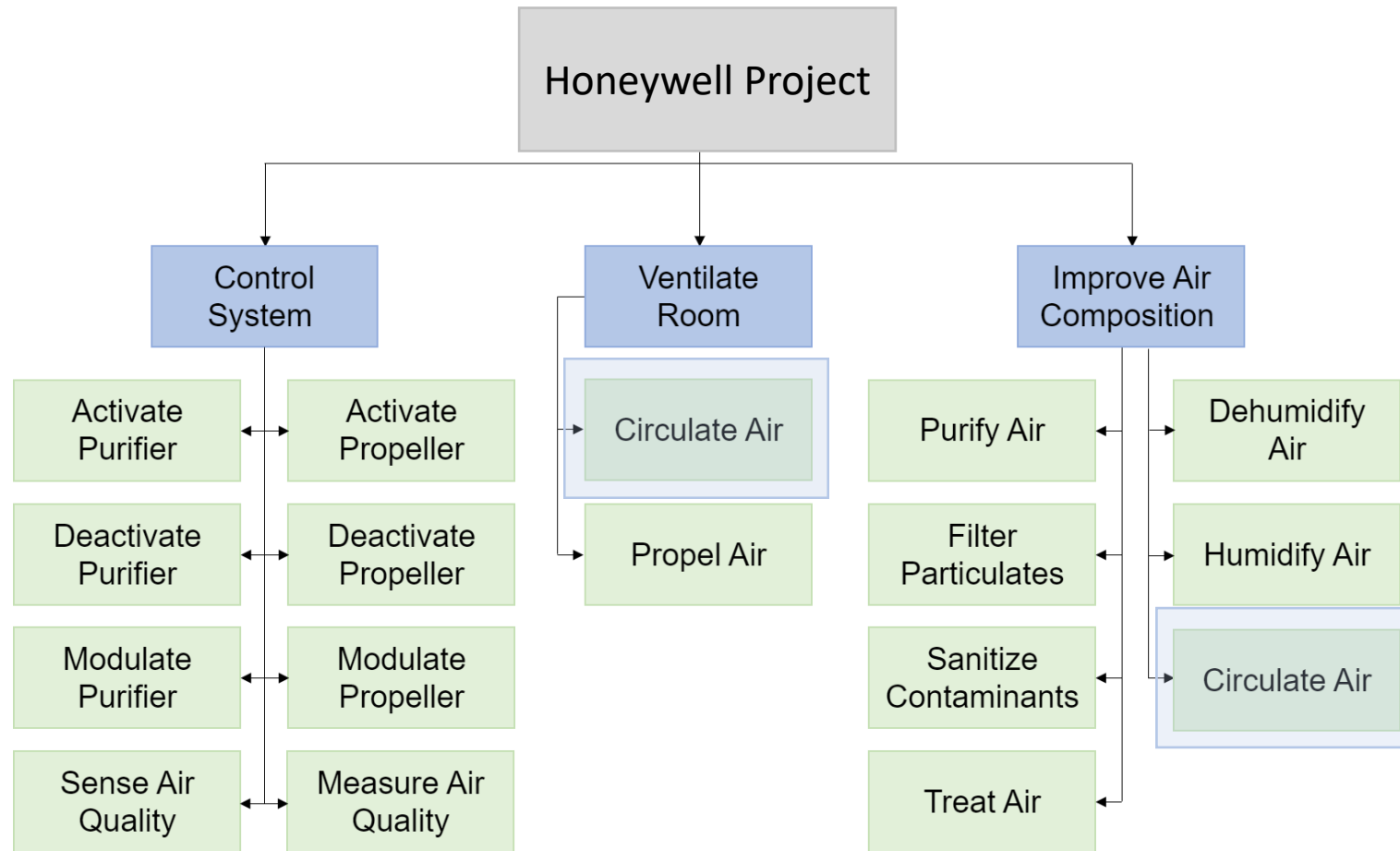
Whitley Pettis

Future work

Sourced: creativecommons.org

→ Targets and Metrics

→ Concept Generation

→ Concept Selection

→ Bill of Materials
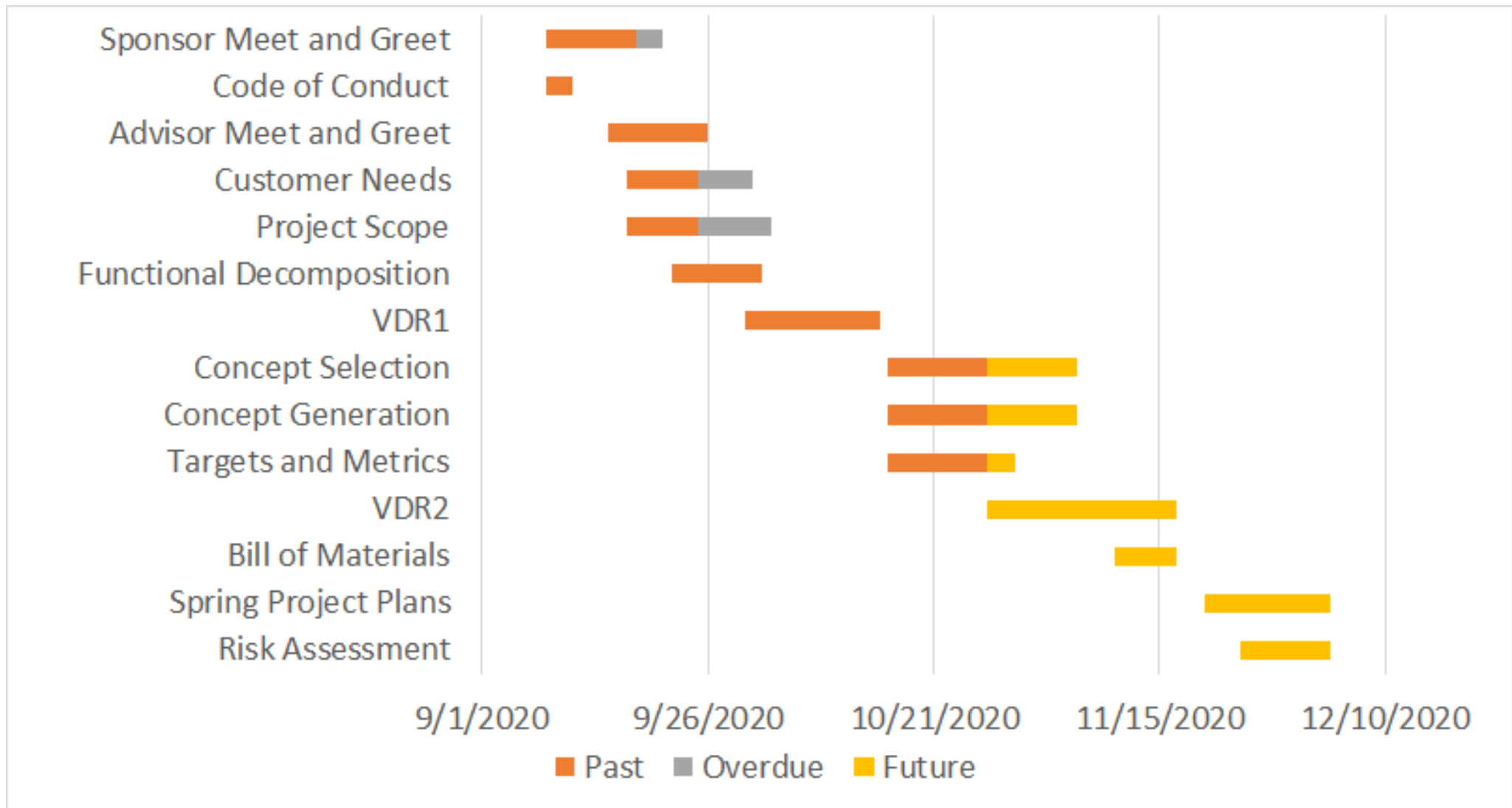
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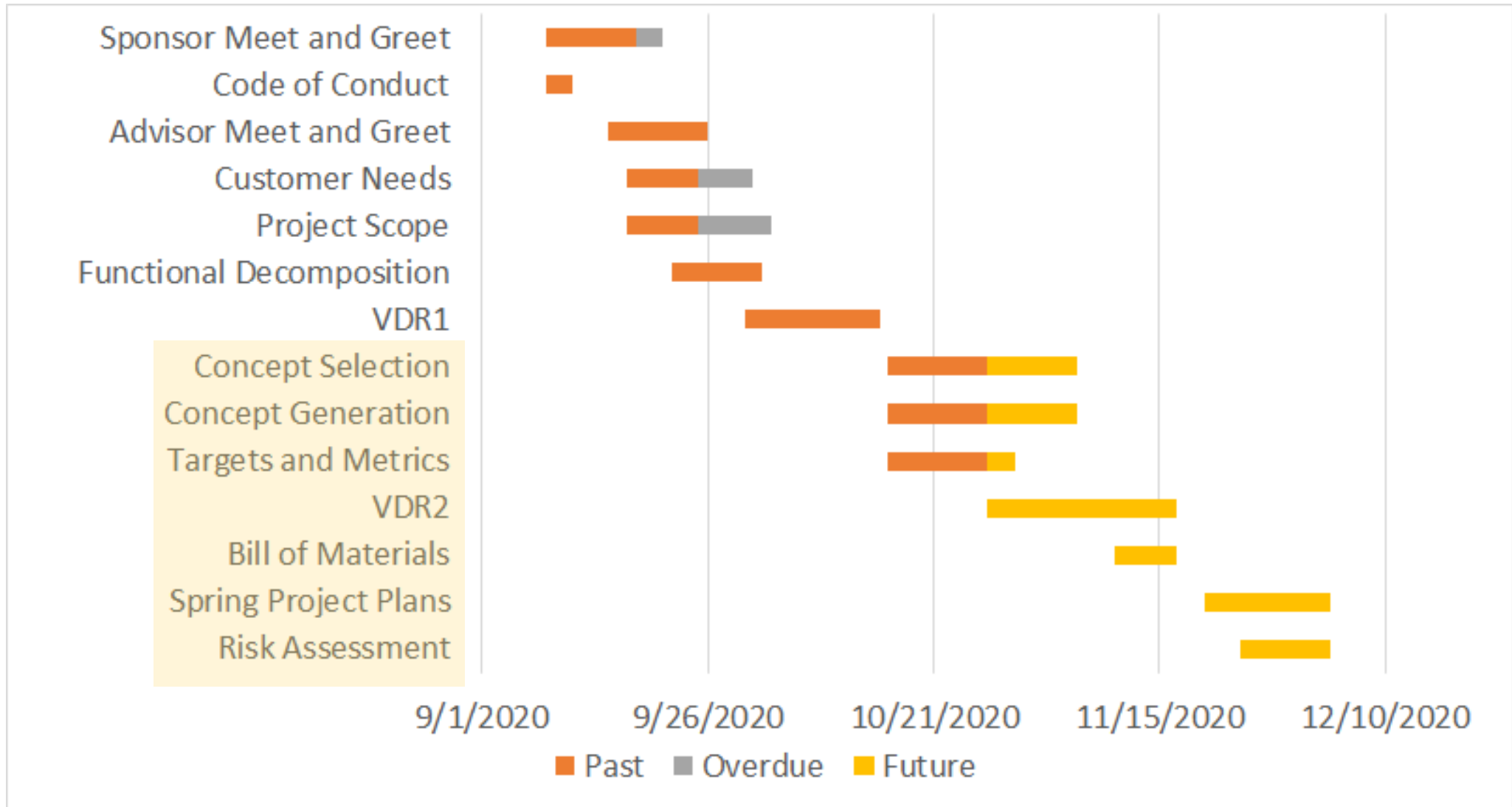
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Key Takeaways

➜ The project will improve the air quality of the FAMU-FSU College of Engineering

➜ A key requirement of the project is that it measures air quality

➜ The project will work in conjunction with the existing FAMU-FSU College of Engineering infrastructure

Whitley Pettis

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References

[1] "FAMU-FSU College of Engineering." eng.famu.fsu.edu. Accessed October 10, 2020.

[2] Environmental Protection Agency. (1989). Report to Congress on Indoor Air Quality.

[3] Moreno, T., & de Miguel, E. (2018). Improving air quality in subway systems: An overview. Environmental Pollution , 829-831.

Whitley Pettis

Questions

Whitley Pettis

Backup Slides

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Minor functions	Major functions		
	Control System	Ventilate Room	Improve Air Composition
Sense Air Quality	x		
Measure Air Quality	x		
Activate Propeller	x		
Deactivate Propeller	x		
Modulate Propeller	x		
Activate Purifier	x		
Deactivate Purifier	x		
Modulate Purifier	x		
Propel Air		x	
Circulate Air		x	x
Purify Air			x
Treat Air			x
Filter Particulates			x
Dehumidify Air			x
Humidify Air			x
Sanitize Contaminants			x
Total	8	2	7

Questions	Customer Statement	Interpreted Need
Would using the most outside air be efficient enough to clean air?	The best method to clean the air, would be 100% outside air utilization. This would be too expensive	Clean and recycle existing indoor air.
How do healthy buildings affect energy consumption?	Using systems to work more efficiently, increases consumption. Portable and battery powered units with data loggers.	A device that is portable and battery powered would be more appropriate.
Are there any structural or sizing limitations? e.g. volume, height, length, weight, etc.	The device cannot be added to the existing structure of mechanical equipment. Small, and lightweight to be moved on a cart.	A portable device that can be moved easily.
In what environment will the project be used? e.g. home, office, stadium, retail, etc.	The idea is to create a product that can be used at FAMU-FSU COE	The product is designed to work in classrooms, labs, and study spaces.
Should it be geared towards reducing contamination or increasing ventilation?	The device should be geared towards reducing contaminants.	The product reduces contamination and increases ventilation.

Do you have any existing products or previous research that could be used to help this project?	Similar projects are being done at other universities.	The product will resemble other products that have been installed in other universities.
Will our project be used in conjunction with an existing product or will an entirely new system need to be designed?	Since we have products already made, I do not figure that you all will create an entirely new system.	The product will work in conjunction with an existing product.
If it will be used in conjunction with another system, what type of system? Do you have any specific details?	We will donate products for you to work with.	The project will make use of existing Honeywell products.
Does the current COE mechanical system include sensors?	Some rooms have humidity sensors, but there are no Volatile Organic Compounds (VOC) or particulate sensors.	Device will measure the VOC, CO2, humidity, temperature, and particulate levels
Is there a problem with the current purifiers?	Current purifiers would only clean 10% of the air in the room, because of placement.	The device will clean and monitor more of the air in the spaces.
What is the nature of the contamination we are aiming to reduce? e.g. viruses, bacteria, fungi, odor, etc.	Reducing the replication of airborne pathogens	The product reduces viruses that are in the hotspot area.
Does the project need to be an automatic or a manual system?	It would be great for it to be automatic but if it ends up having to be manual that will work.	The product is activated automatically.