Università degli Studi di Napoli Federico II

DiARC

DBE
INTERNATIONAL MASTER OF SCIENCE
DESIGN FOR THE BUILT ENVIRONMENT

PROFESSORS
Erminia ATTAIANESE
Alessio BOTTA
Sergio RUSSO ERMOLLI

TUTORS
Morena BARILÀ
Daniele DE PASCALE
Sayna ROTBEI

ATELIER OF INTERACTION DESIGN

Modular Ease

AA_2023/2024

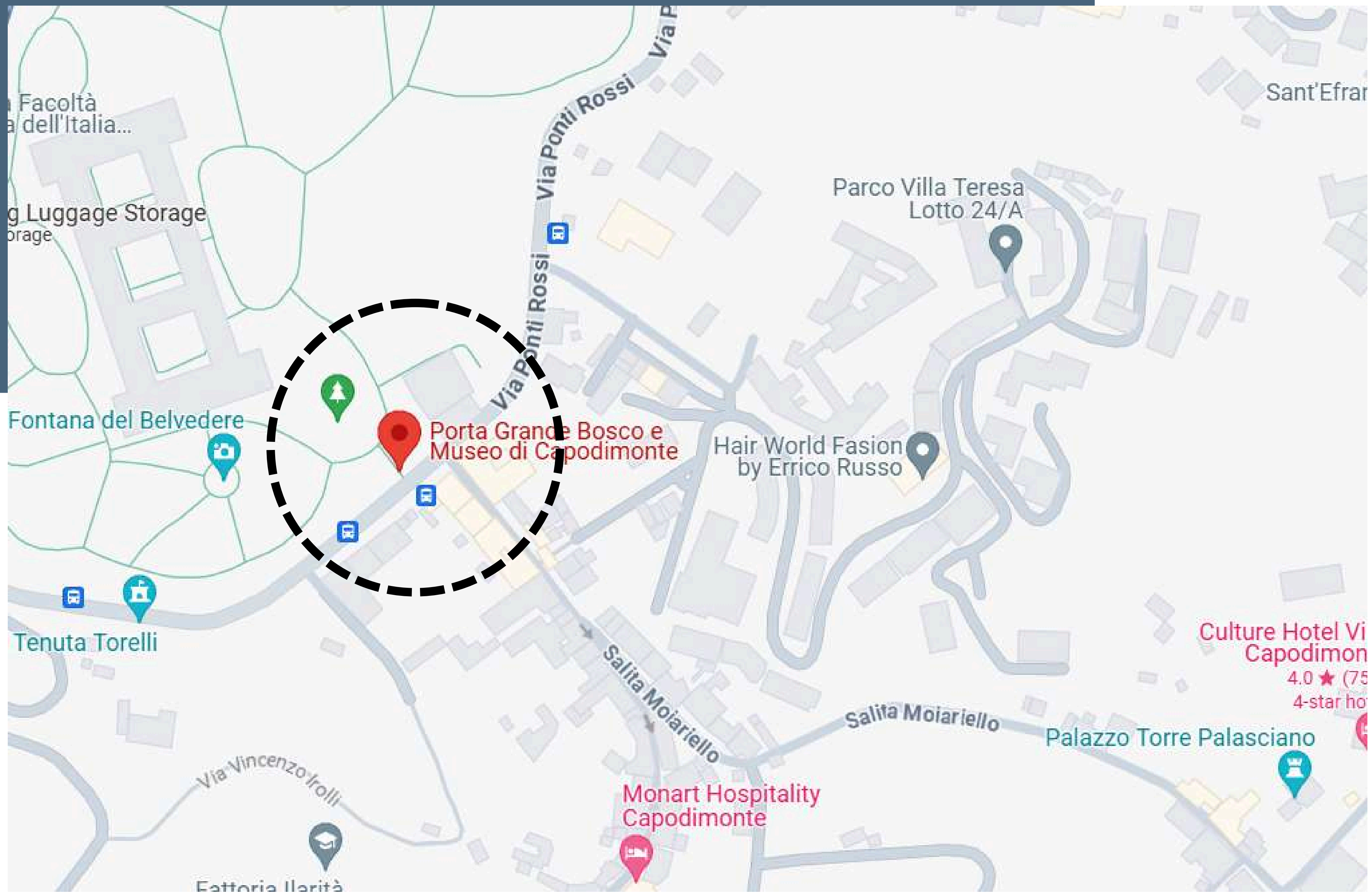
Tara fardmanesh, Gita ghodsi

FINAL PRESENTATION - JUNE 25TH 2024

Modular Ease

- **Modularity:** The term "Modular" directly highlights the flexibility of furniture, emphasizing the ability to reconfigure and customize pieces according to the user's needs.
- **Ease:** The word "Ease" suggests **simplicity** and **convenience**, indicating that our furniture is **user-friendly** and designed to make life easier for the user through its flexibility and adaptability.

LOCATION

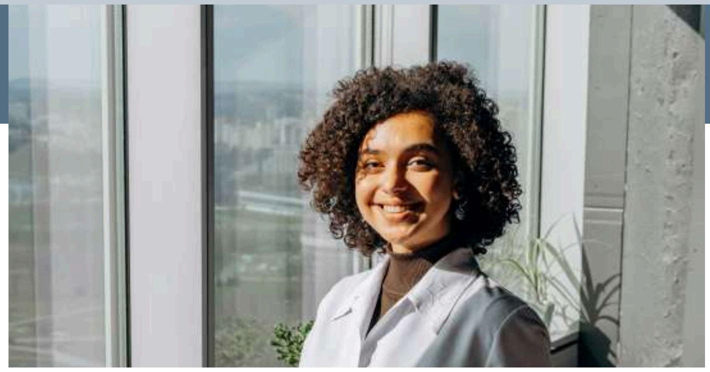

Facoltà
dell'Italia...
Luggage Storage
Fontana del Belvedere
Tenuta Torelli
Via Ponti Rossi
Porta Grande Bosco e
Museo di Capodimonte
Parco Villa Teresa
Lotto 24/A
Sant'Efra
Hair World Fasion
by Errico Russo
Culture Hotel Vi
Capodimon
Salita Moiariello
Palazzo Torre Palasciano
Monart Hospitality
Capodimonte
Via Vincenzo Irolli

OBJECTIVES

Our primary goal is to develop a **multifunctional** and **flexible** educational space that supports the evolving needs of **modern**, **hybrid education**. This project emphasizes:

- **Community Building**
- **Digital and Physical Integration**
- **Sustainability**

USER PERSONAS



Name	**Lara Müller**	**Erik Johansson**
Gender	Female	Male
Age	21 years old	24 years old
Location	Germany	Sweden
Occupation	student	student

USER PERSONAS 1

Lara

Goals	Gain practical experience in architectural design.	Collaborate with peers on innovative building projects.	Develop a portfolio showcasing architectural skills and creativity.
Needs	Durable furniture that are comfortabe	Studio spaces with ample natural light and ventilation for creative work.	Flexible layouts adaptable for different events and uses.
Challenges	Balancing academic coursework with internship or apprenticeship requirements.	Adapting to new design methodologies and software technologies.	Navigating regulatory requirements and building codes in architectural practice.
Technology Usage	Utilizes architectural design software such as AutoCAD and Revit.	Engages in virtual design collaborations with peers and mentors.	Accesses online resources for architectural inspiration and project references.

USER PERSONAS 2

Erik

Goals	Analyze complex datasets to extract valuable insights and trends.	Develop predictive models and algorithms for data-driven decision-making.	Contribute to the advancement of data science research and applications.
Needs	A comfortable outdoor space to relax between classes	A place to eat meals and socialize with friends	Efficient storage solutions that save space
Challenges	Processing large volumes of data and managing data quality issues.	Translating technical findings	Keeping pace with advancements in data analytics and machine learning
Technology Usage	Utilizes programming languages such as Python and R for data analysis.	Collaborates with team members using data visualization tools like Tableau.	Accesses online courses and tutorials to expand skills

PROJECT REQUIREMENTS BASED ON PERSONAS

1. Space Requirements
2. Furniture Requirements
3. Digital and Physical Integration
4. Sustainability Requirements

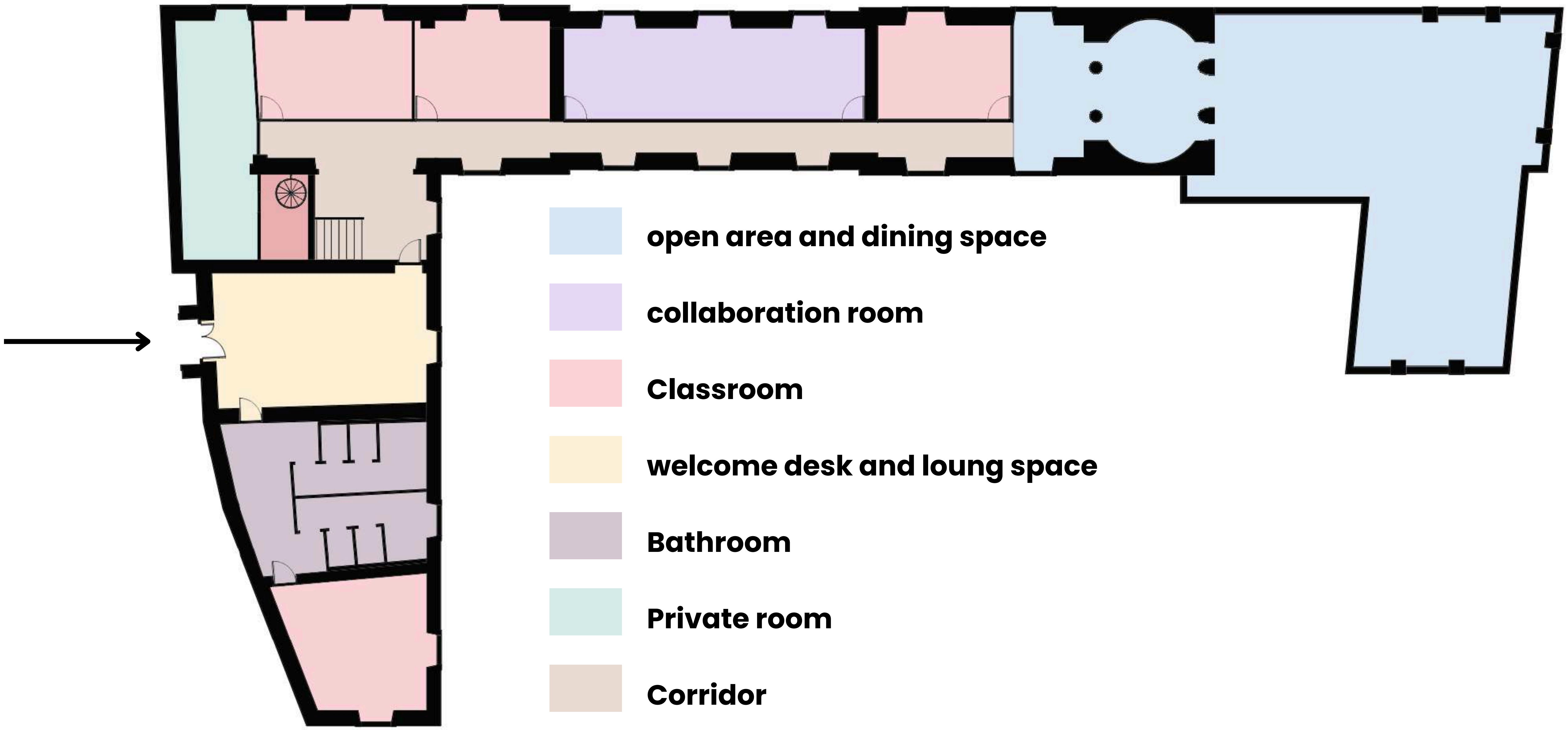
- Welcome desk
- Collaboration Room
- Terrace&Bar
- classroom
- Private Room

- Modularity
- Multifunctionality
- Comfort
- Durability

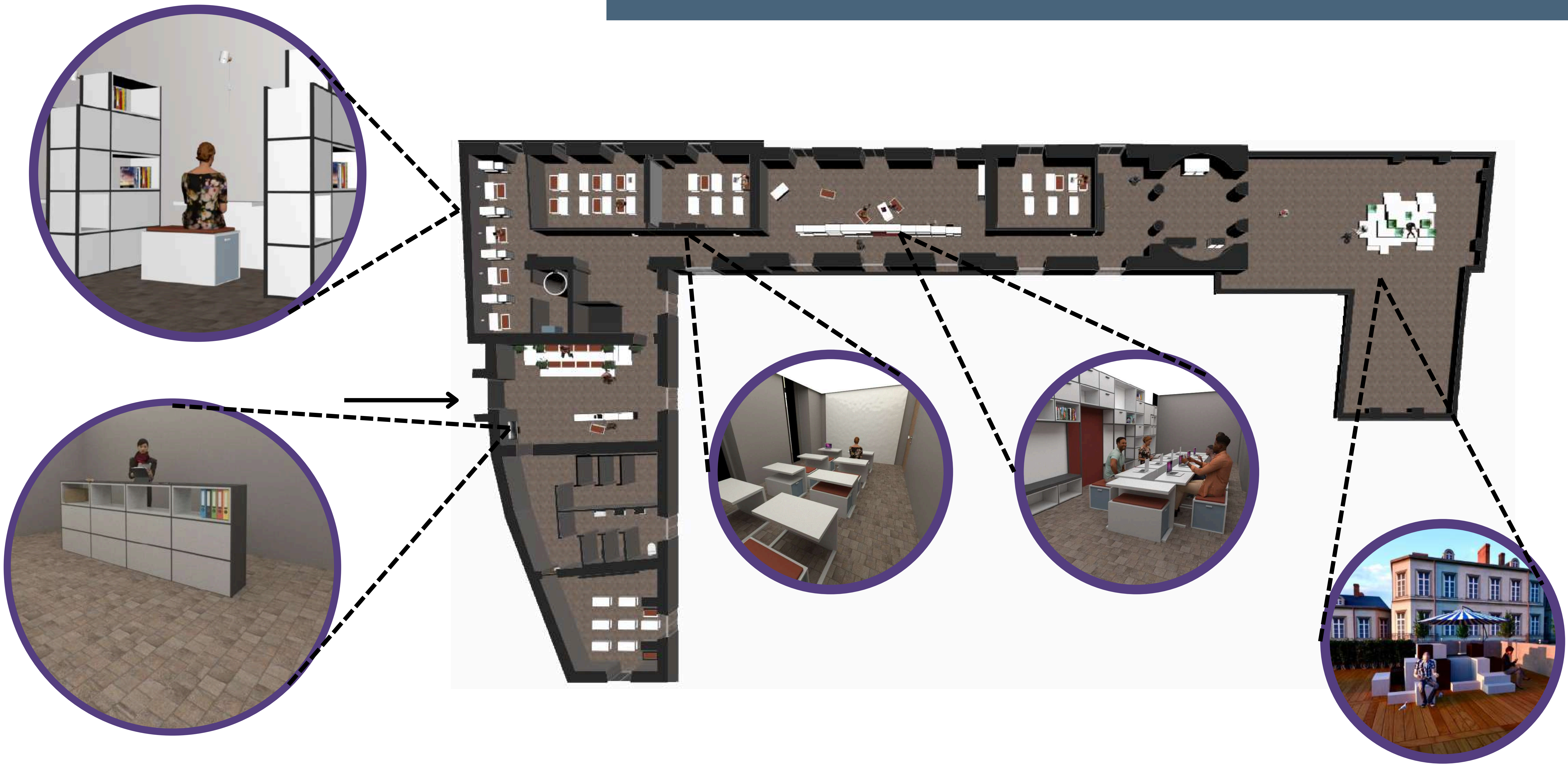
- Integrated Technology
- Flexiblility

- Solar Panels
- Energy-Efficient Fixtures

SUGGESTED PLAN



SUGGESTED PLAN



MATERIALS

Wood Materials:

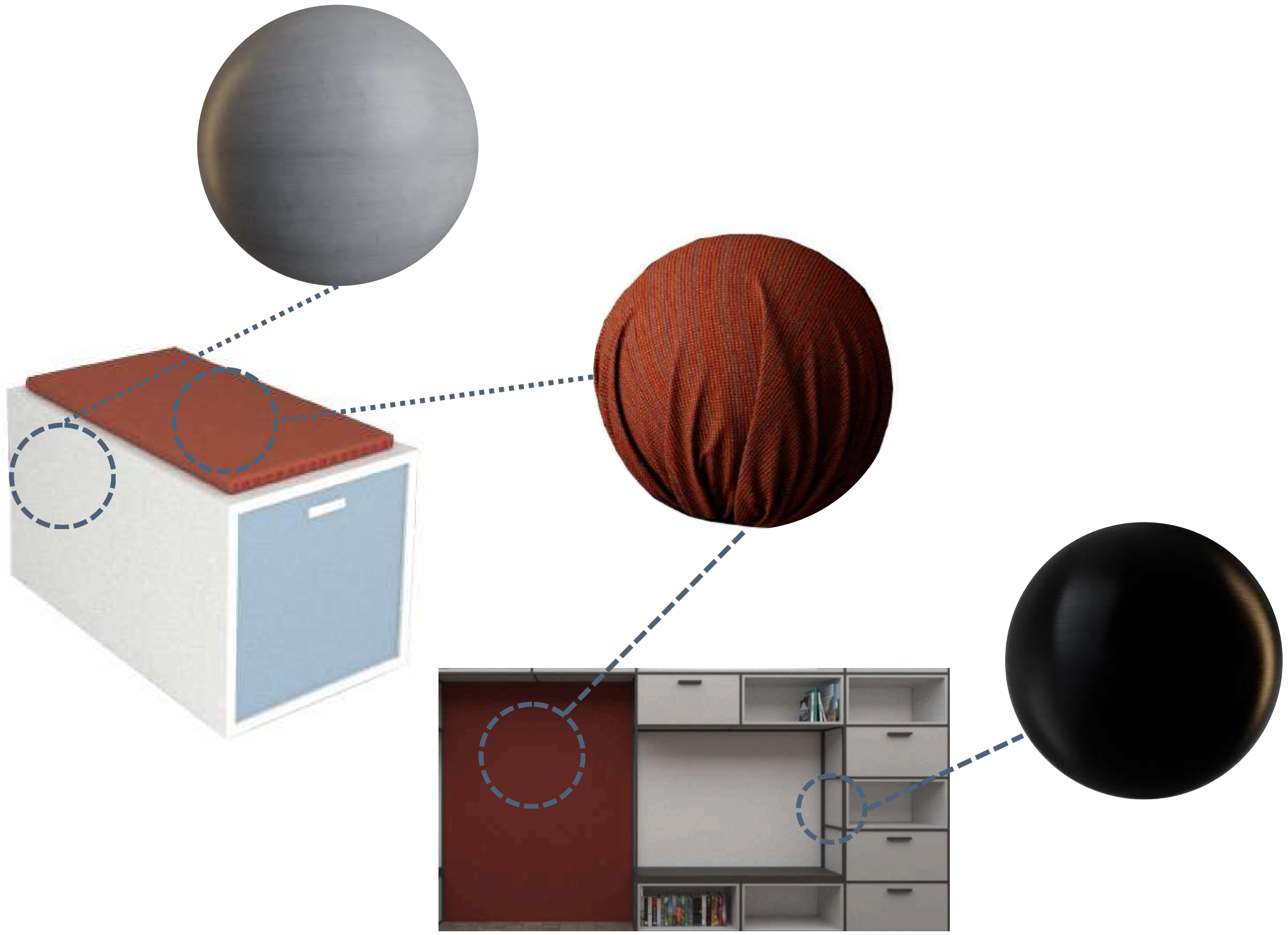
Pine: Used for storage boxes and shelves, providing a lightweight yet sturdy solution.

Metal Materials:

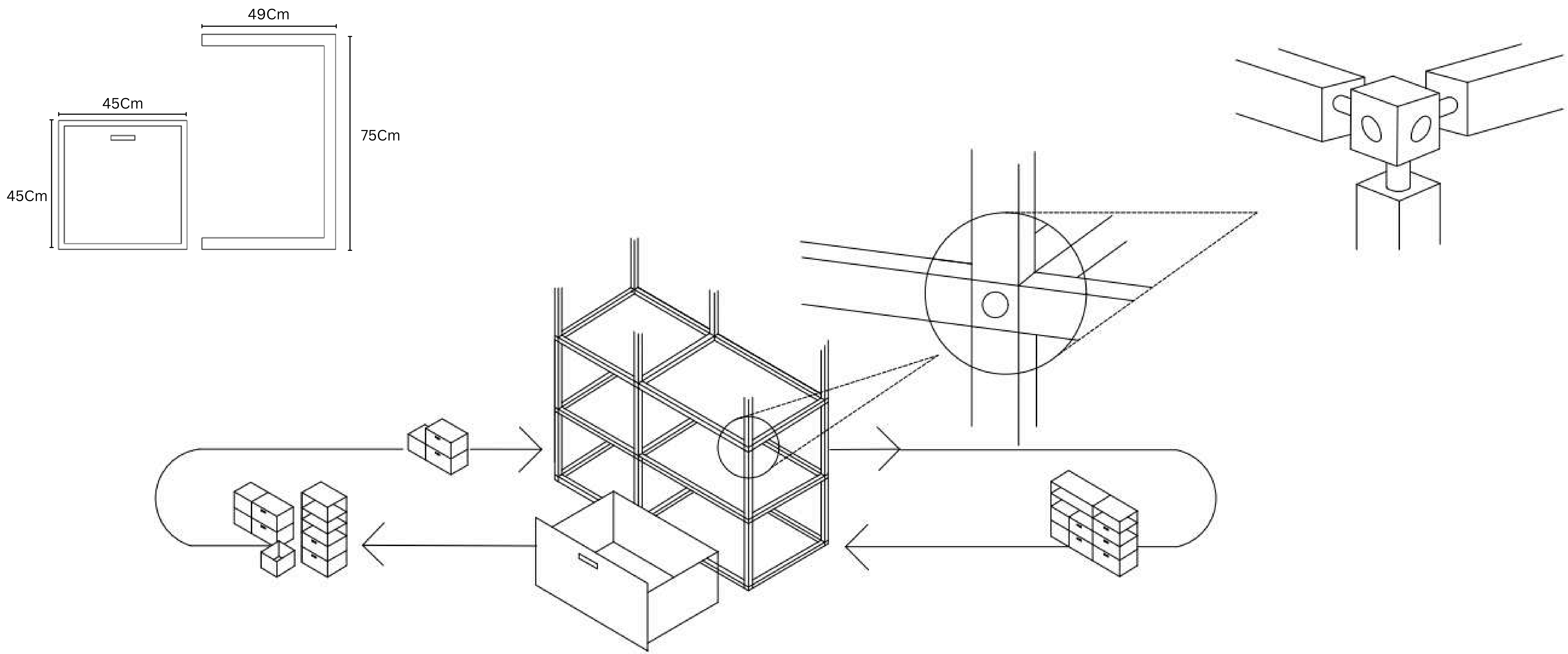
Aluminum: Chosen for the structural framework to minimize weight while maintaining strength and corrosion resistance.

Upholstery Fabric:

The outer cover of the chair seat cushion is made of durable upholstery fabric. This fabric is chosen for its visual appeal, comfort, and durability.

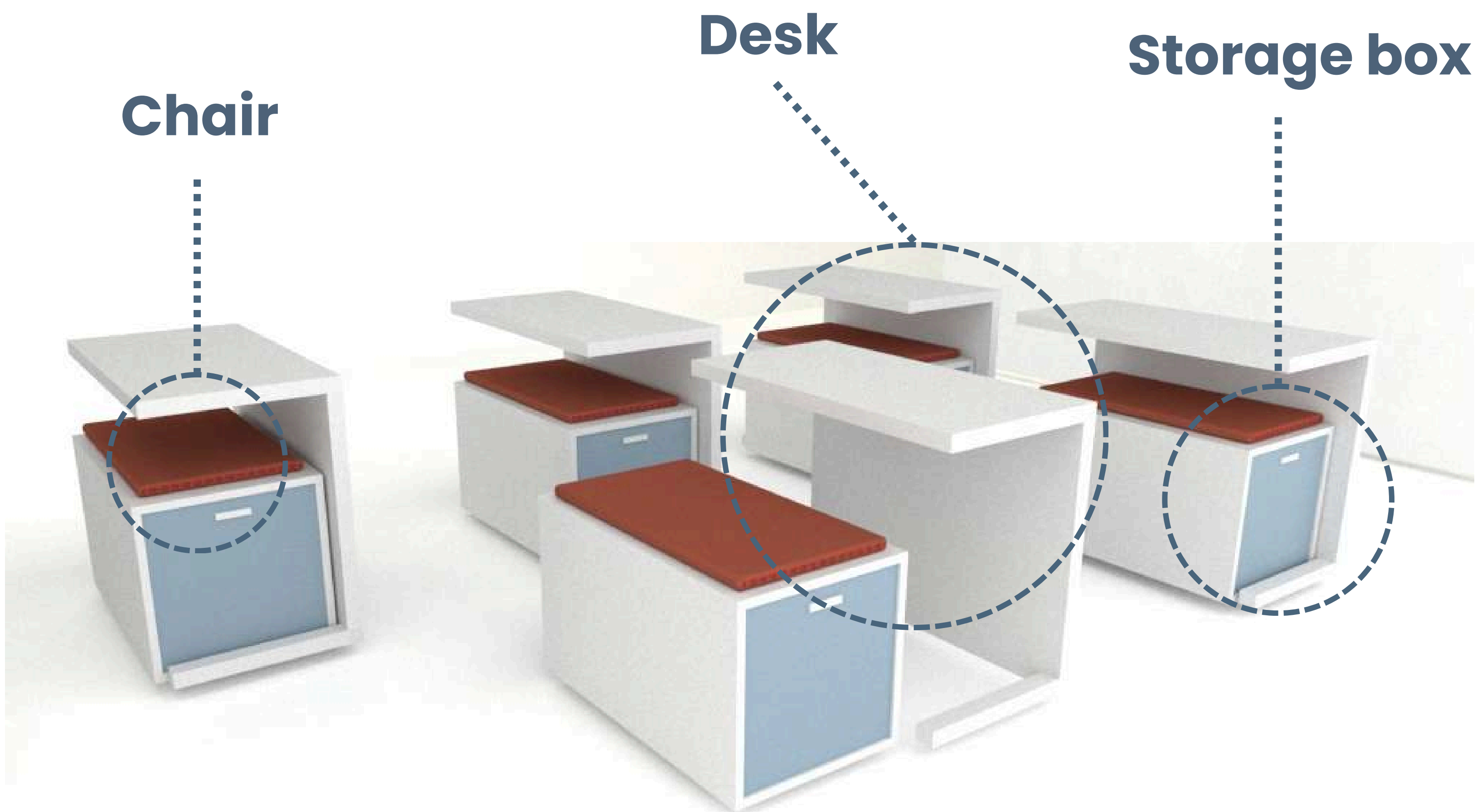


DETAILS

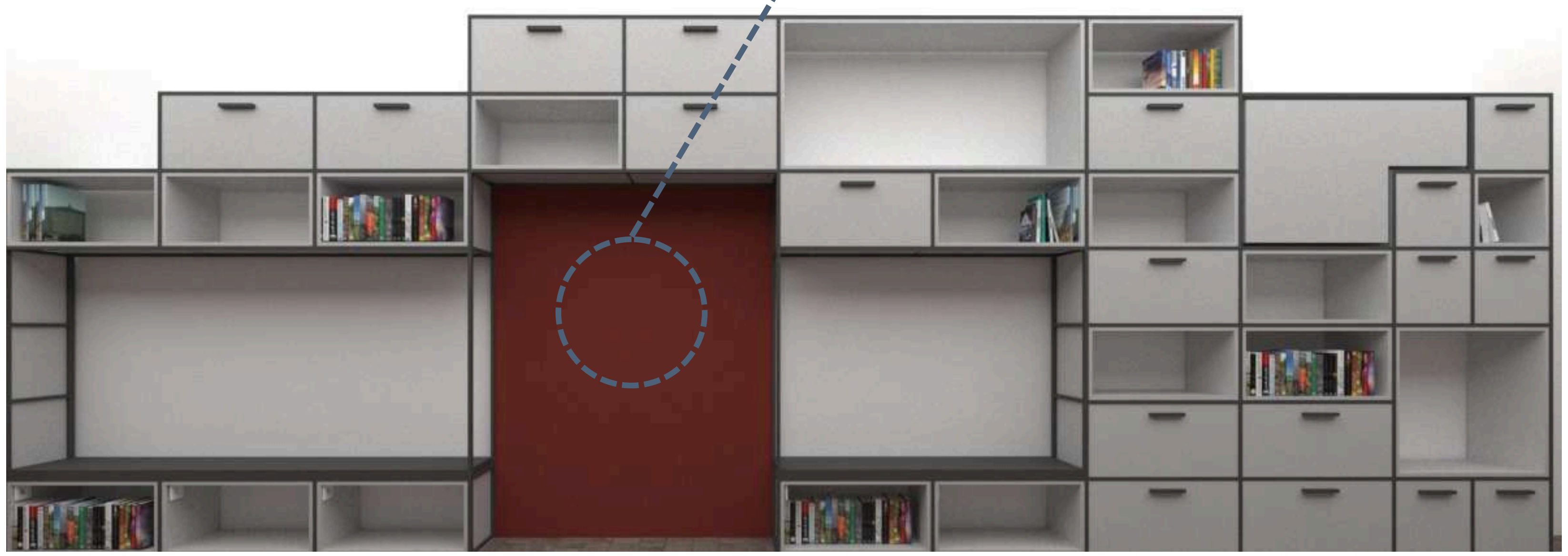


COMBINATIONS

Seat cushion

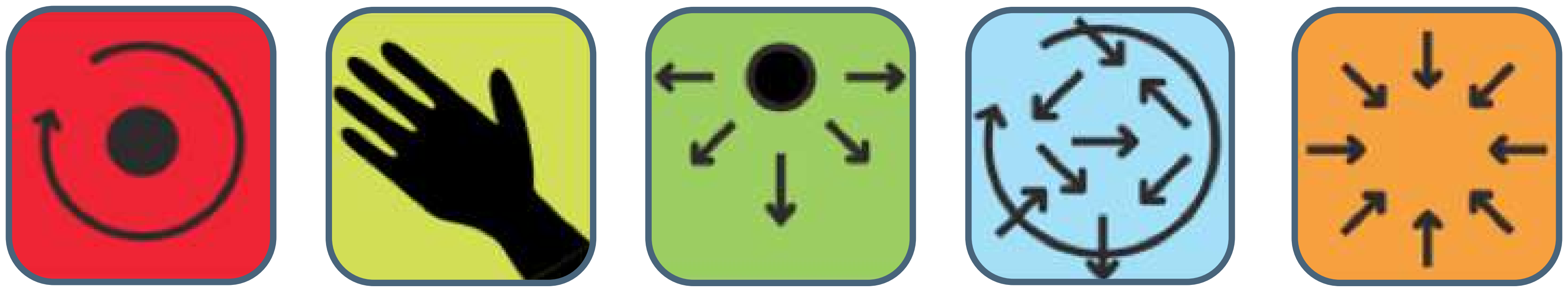


COMBINATIONS



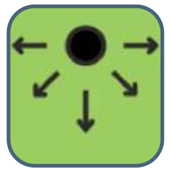
CONNECTING PERSONAS AND SPACES

Cave | Laboratory | Show-off | Campfire | Watering hole



WELCOME DESK

Show-off



FUNCTIONS

COMFORT

- comfortable seating for visitors awaiting assistance

TECHNOLOGY INTEGRATION

- easy access to power outlets and charging stations.

INFORMATION CORNER

- Allow guests to browse brochures and learn more about our services

CLASS ROOM

Campfire

Laboratory

FUNCTIONS

INTEGRATED SEAT STORAGE

- Provide a storage compartment within the seat without compromising space.

TECHNOLOGY INTEGRATION

- incorporate digital tools.
- easy access to power outlets and charging stations.

MOBILITY

- The possibility of moving furniture for group or individual work

COLLABORATION ROOM

Laboratory

FUNCTIONS

GROUP DISCUSSION

- collaborative conversations.
- idea sharing and active participation.
- comfortable seating arrangements for group interactions.

MOBILITY

- flexible furniture
- movable chairs, tables, and partitions
- quick reconfiguration for different group sizes

TECHNOLOGY INTEGRATION

- incorporate digital tools.
- easy access to power outlets and charging stations.

PRIVATE ROOM

Cave

FUNCTIONS

TECHNOLOGY INTEGRATION

- incorporate digital tools.
- easy access to power outlets and charging stations.

MOBILITY

- The possibility of moving furniture for one or two person
- using movable partitions to create a flexible workspace for two people

PRIVACY & SILENCE

- a dedicated personal workspace equipped with all the necessary facilities for focused work.

TERRACE

Show-off
Campfire

FUNCTIONS

WEATHER RESISTANCE

- All-season outdoor shade that resists both sun and rain

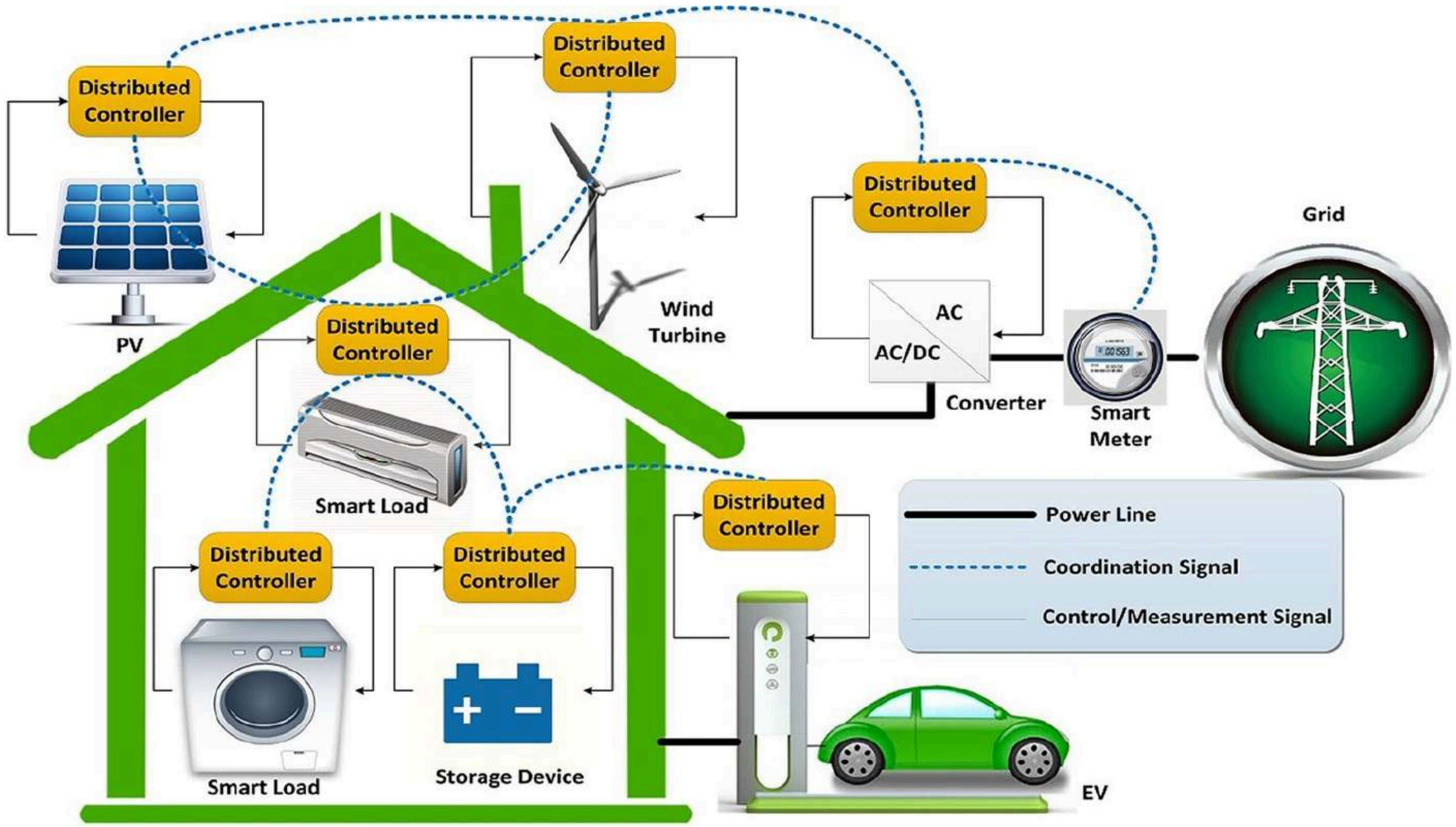
VERSATILE SOCIAL SPACE

- The balcony invites students to relax, socialize, and enjoy meals together

MODULAR FLEXIBILITY

- Stackable boxes offer customizable layouts, maximizing space efficiently

Producing Electricity Energy Smart and Application



ADVANTAGES

Smart Energy Management Systems (SEMS) are innovative solutions that optimize energy usage in residential and commercial sectors.

1

Energy Efficiency:
Smart EMS enables precise monitoring and control of energy consumption in real-time, allowing for the optimization of energy usage throughout a facility.

2

Cost Savings:
Smart EMS helps reduce energy bills by optimizing energy usage, implementing demand response strategies, and leveraging renewable energy sources such as solar power.

3

Environmental Sustainability:
By optimizing energy usage and reducing waste, smart EMS contributes to environmental sustainability by lowering greenhouse gas emissions and reducing the carbon footprint of buildings and facilities.

DISADVANTAGES

1

Initial Cost:
Starting a SEMS for solar panels means spending money upfront on things like monitors and inverters.

2

Maintenance and Upkeep:
After setting up a SEMS for solar panels, you need to keep maintaining it to make sure everything works well.

3

Integration Challenges:
Making SEMS work with your current solar panels, inverters, and grid connections can be tricky because they might not all fit together perfectly.

Smart Solar Panel Brands for Smart Energy

SunPower

LG Solar

Canadian Solar

Trina Solar

Comparison Between Brands

Established Reputation

Trina Solar is a well-known and trusted company, People believe in its reliability. It's seen as more dependable than LG Solar and Canadian Solar.

Competitive Pricing

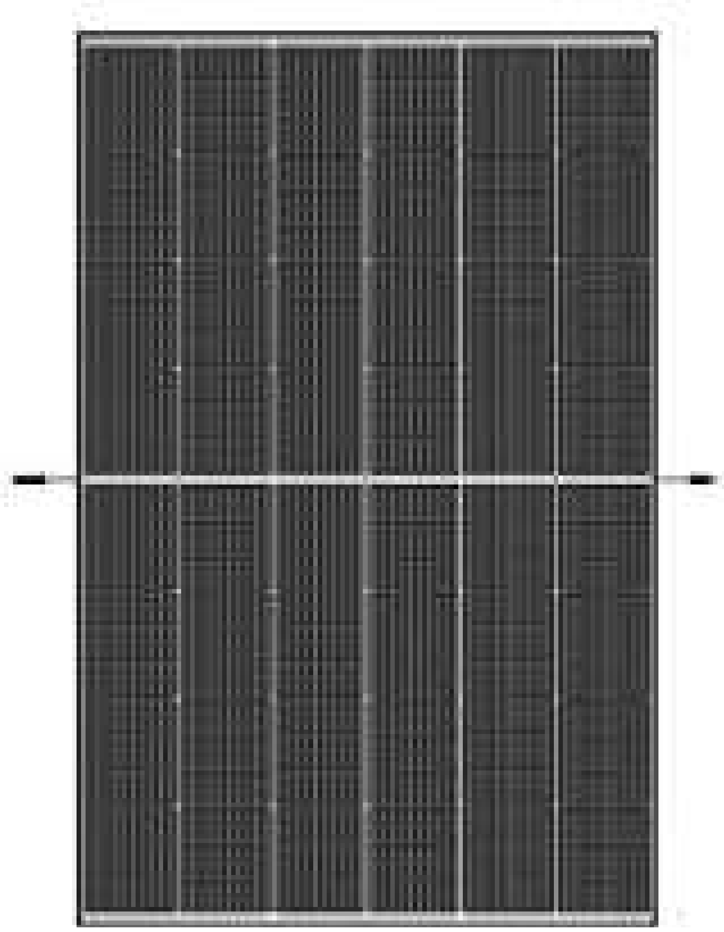
Trina Solar offers great value with competitive prices, making it a top choice over SunPower, LG Solar, and Canadian Solar.

Comprehensive Product Range

Trina Solar has many types of solar panels for different needs. They offer more choices than SunPower, LG Solar, and Canadian Solar, which focus on fewer options.

Devices

Solar panel



Trina Solar Panel
Vertex s

Batteries

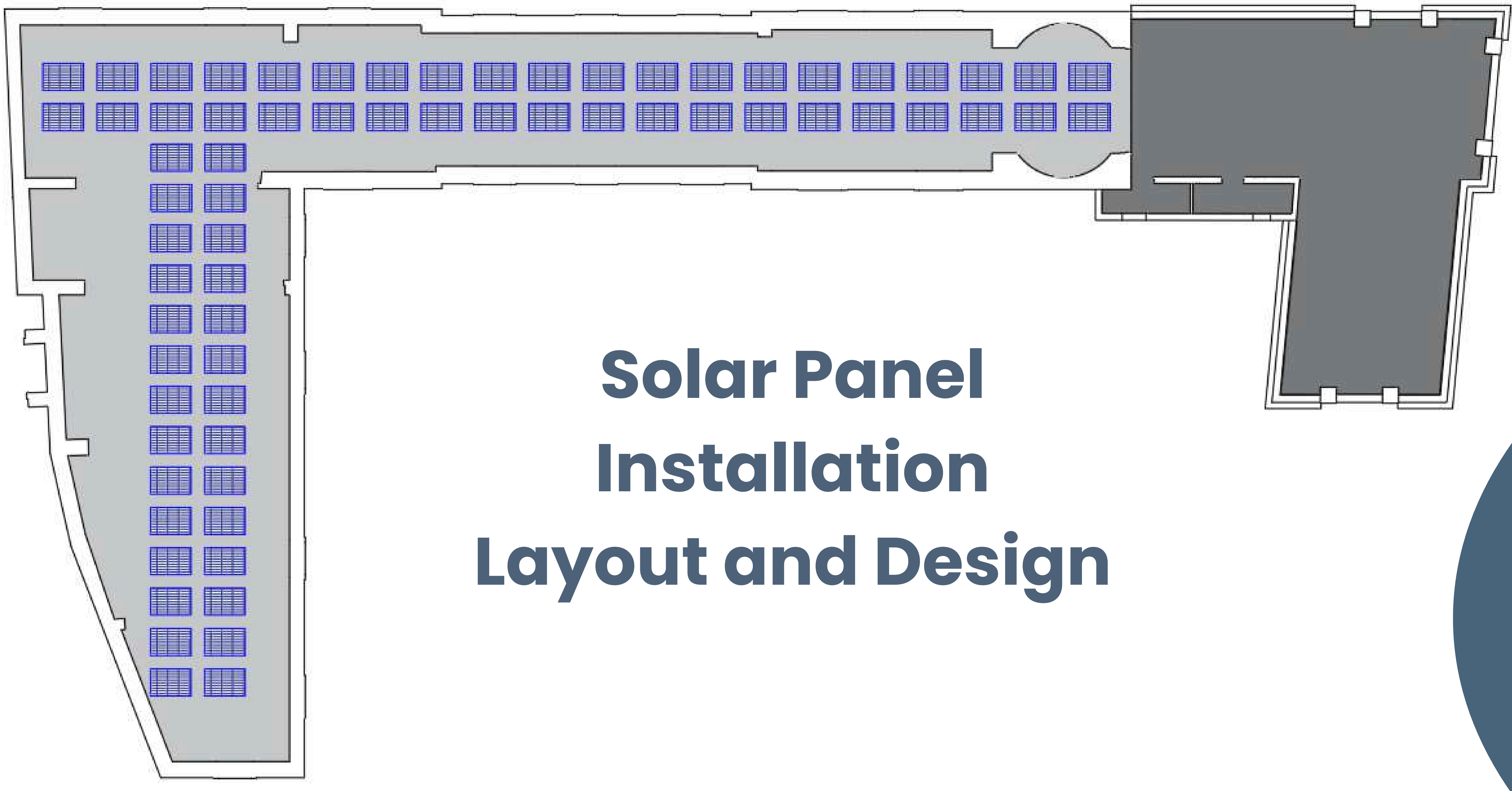
Samsung SDI E3 Series Battery

Racking System

UPS
Uninterruptible Power Supply

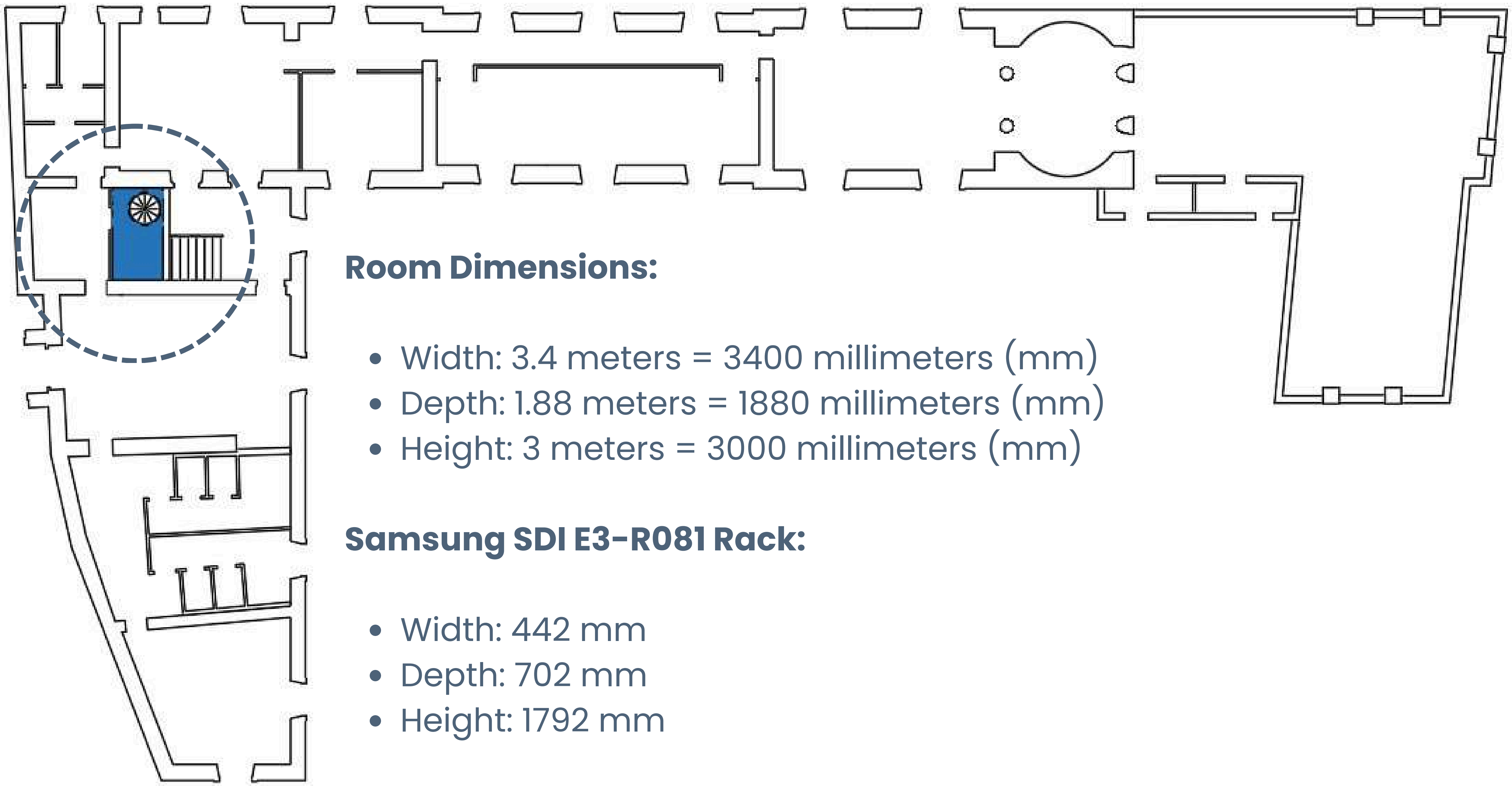
Solar Power System Design and Requirements

- Number of solar panels: 68
- Area of each solar panel: 1.5 meters by 1 meters
- Efficiency of solar panels: 17%
- Average energy consumption: 38 kWh/day
- Average daily sunlight hours: 5 hours



Solar Panel Installation Layout and Design

Battery Location



Room Dimensions:

- Width: 3.4 meters = 3400 millimeters (mm)
- Depth: 1.88 meters = 1880 millimeters (mm)
- Height: 3 meters = 3000 millimeters (mm)

Samsung SDI E3-R081 Rack:

- Width: 442 mm
- Depth: 702 mm
- Height: 1792 mm

The **E3-R081** Rack would fit in the room with some extra to space.

Total Solar Panel Capacity (kW):

$$TotalCapacity(kW) = \frac{(NumberOfPanels * CapacityPerPanel)}{1000}$$

$$TotalCapacity(kW) = \frac{68 \times 425}{1000} = 29.9$$

Total Capacity is a good starting point for understanding how much solar energy our system can potentially generate.

Battery Selection:

Samsung SDI E3 Series **E3-M090**

Type: **Pre-configured battery rack**

Capacity:
Rated capacity: 81 kWh
Usable capacity (estimated): 64.8 kWh (assuming 80% usable capacity)

Voltage Range: **634 - 822 V**
Module Capacity: **111 Ah**
Dimensions: **442 x 702 x 1,792 mm (length x width x height)**
battey weight: **55 kg**
Rack weight: **550 kg**

Rack Selection:

E3-R081 Rack:

This rack has a capacity of 81 kWh, which is closer to our requirement.
The usable capacity of an E3-R081 rack would be around 64.8 kWh (81 kWh * 0.8).

$$NumberOfRacks = DailyConsumption / UsableCapacityPerRack$$

$$NumberOfRacks = \frac{38kWh/day}{64.8kWh/rack}$$

we need 1 E3-R081 Rack

Battery Capacity (kWh):

*Battery Capacity = Average Energy Consumption **X** Days of Autonomy*
Battery Capacity = 20 kWh/day× 2 days = **40 kWh**

Daily Energy Production (kWh):

*Daily Energy Production = Total Solar Panel Capacity **X** Average Daily Sunlight Hours*
Daily Energy Production= 29.9 kW × 5 hours/day = 149.5 kWh/day

Cost of Solar Panels:

$$TotalCostOfPanels = NumberOfPanels * PricePerPanel$$

$$TotalCost = 68panels \times 428.40 \approx 29,131.12$$

Cost of E3-R081 Rack:

Pricing for commercial-grade battery systems, like the E3 Series, is not publicly available.

E3-R081 Battery Rack Price Estimation:

Average €20,000

Additional Costs to Consider:

Solar Inverters:
convert the DC electricity from the solar panels into usable AC for your school.
Costs: €5,000

Mounting System:
The racking system that holds the panels on your roof.
Costs: €2,000

Other costs (wiring, interconnection fees, monitoring equipment) **:**
Around €5,000

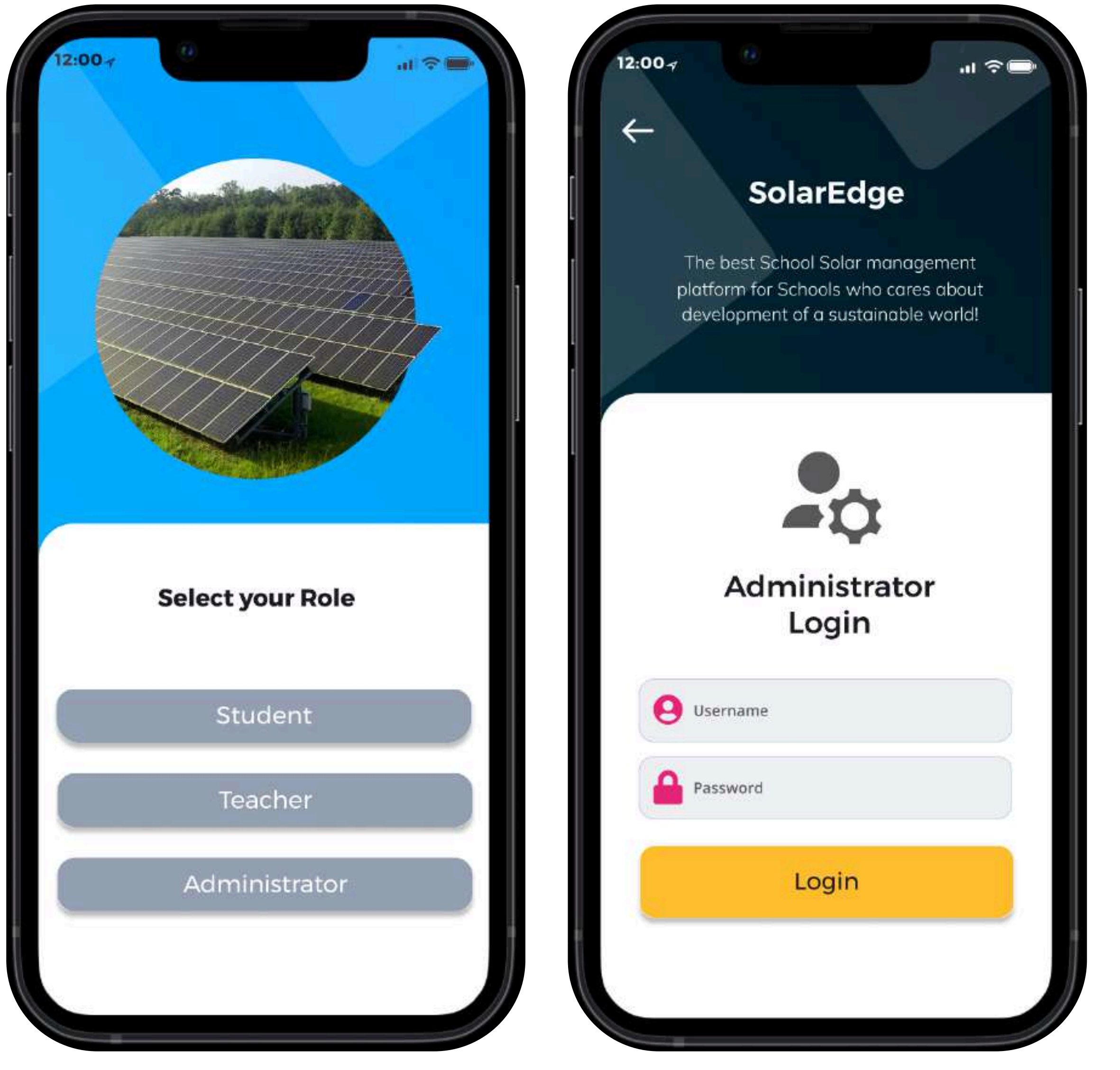
Total Cost of Solar Power System:

Material Cost:

Rack + Solar Panels + Inverters + Mounting System + Other costs

€20,000 + €29,131 + €5,000 + €2,000 + €5,000
= €61,131

Outline of the Mobile App



1. Login Screen:

- Users (student, teacher, administrator): Include options for adding more security layers like fingerprint authentication.

2. Dashboards:

- After logging in, users are guided to their individual dashboards.
- Every dashboard showcases pertinent data and functionalities corresponding to the user's assigned role.

🔗 Figma Link

https://www.figma.com/proto/x8uTvswJf3pe6LY7udnloP/Solar
Edge---Fardmanesh%2C-Ghodsi?
type=design&t=SsWRkfFjSsjfqcdu-1&scaling=scale-down&page-
id=0%3A1&node-id=104-804&starting-point-node-
id=104%3A804&mode=design

THANK YOU