Façade-User Archetypes

Exploring the potential of self designed facade-user Archetypes in personalization of external shading systems in office buildings.

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Dr. Alessandra Luna-Navarro

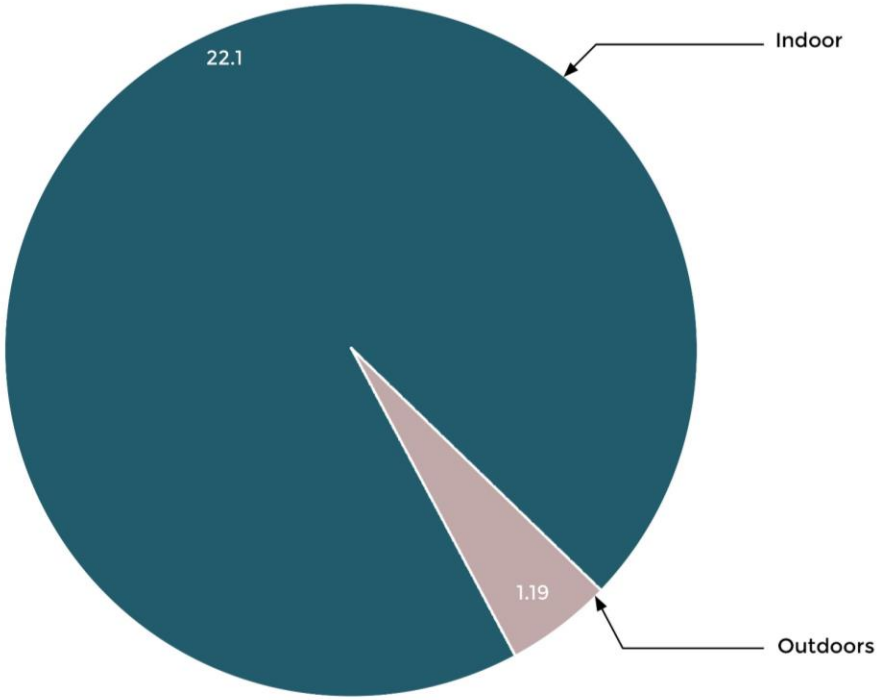
Second Mentor
Dr. Eleonora Brembilla

External Examiner
Willem Korthals Altes

P5 Presentation

Introduction

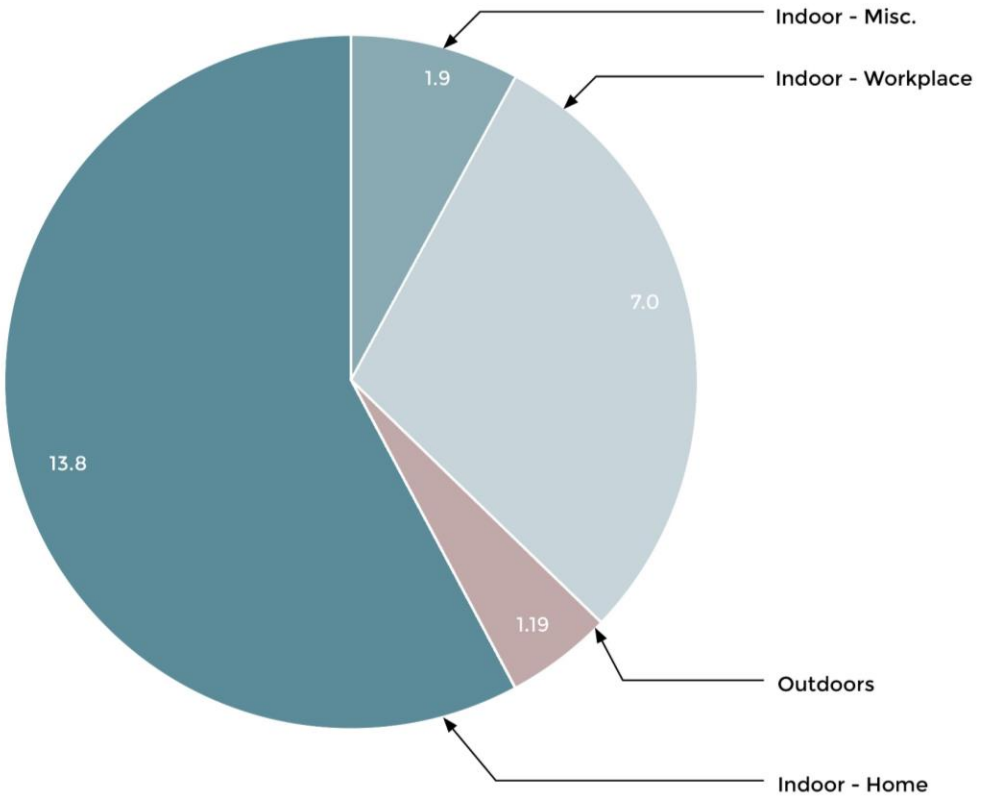
Background



Time spent indoors on the information from Schweizer, C., Edwards, R. D., Bayer-Oglesby, L., Gauderman, W. J., Ilacqua, V., Juhani Jantunen, M., ... & Künzli, N. (2007)

Introduction

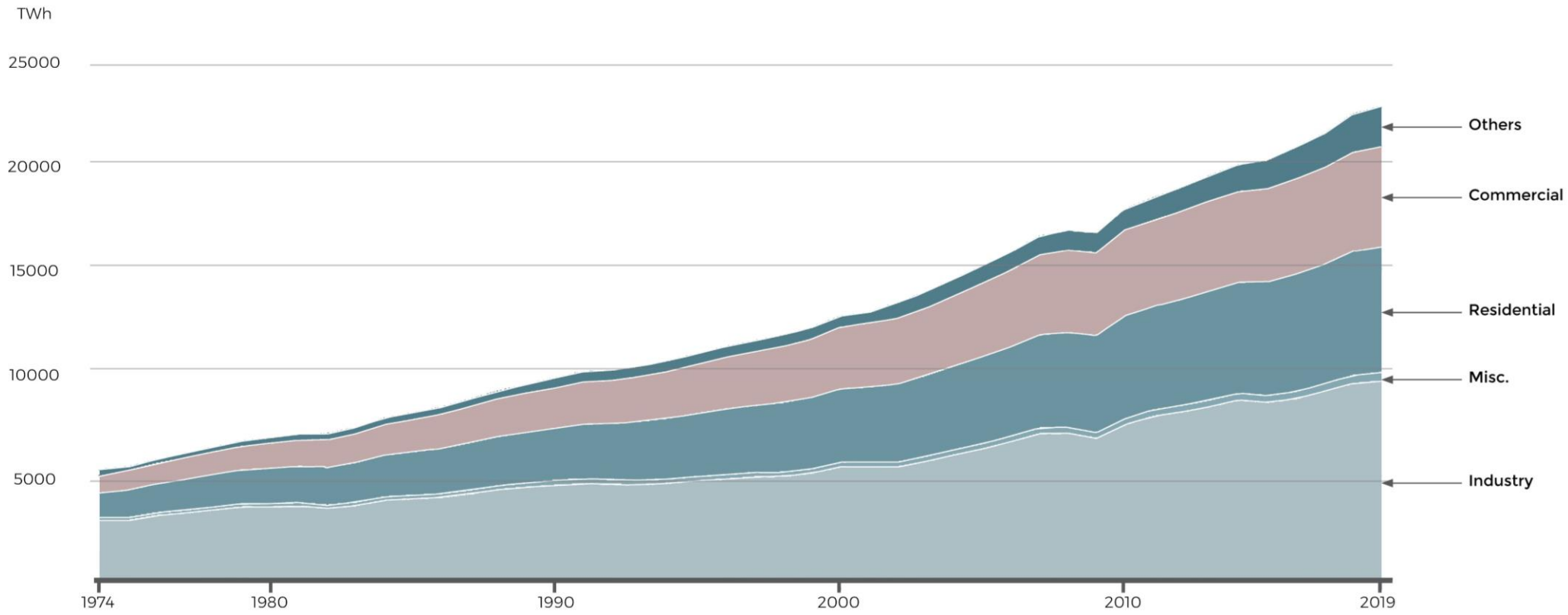
Background



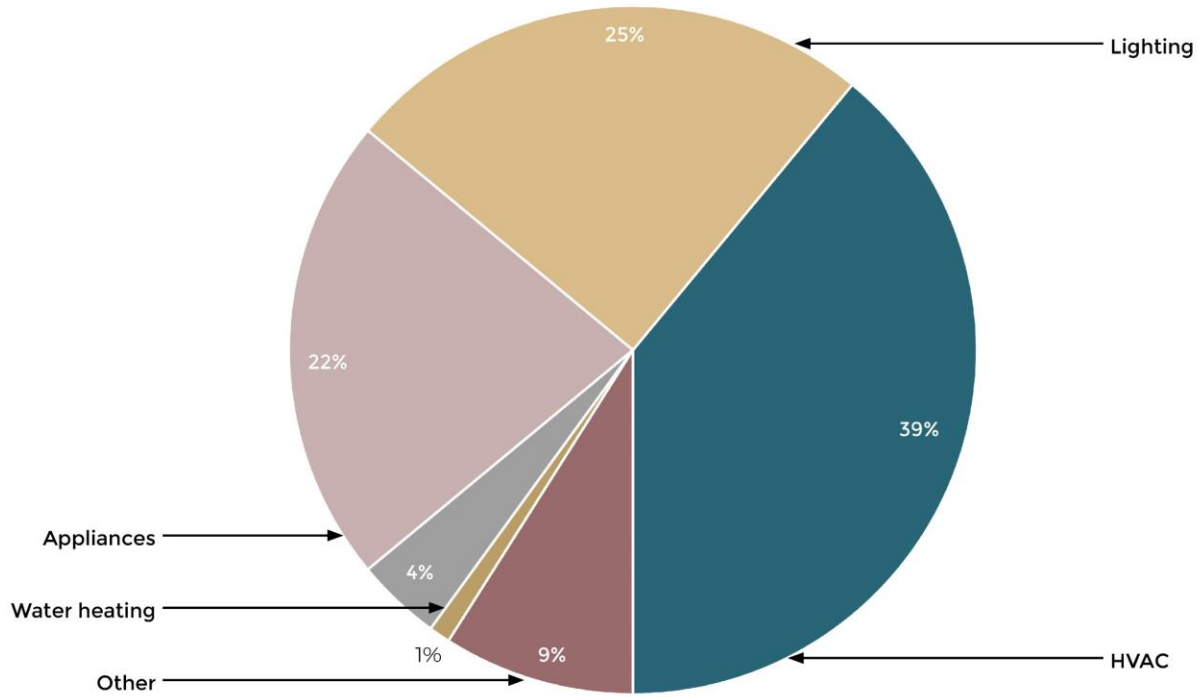
Time spent indoors on the information from Schweizer, C., Edwards, R. D., Bayer-Oglesby, L., Gauderman, W. J., Ilacqua, V., Juhani Jantunen, M., ... & Künzli, N. (2007)

Introduction

Energy impact



Sector wise energy use (Source: IEA (2019)


25%
Lighting
22%
39%
Appliances
4%
Water heating
1%
9%
Other
HVAC

Introduction

Energy impact

Crone Office 680 George Street / Crone Architects

Introduction

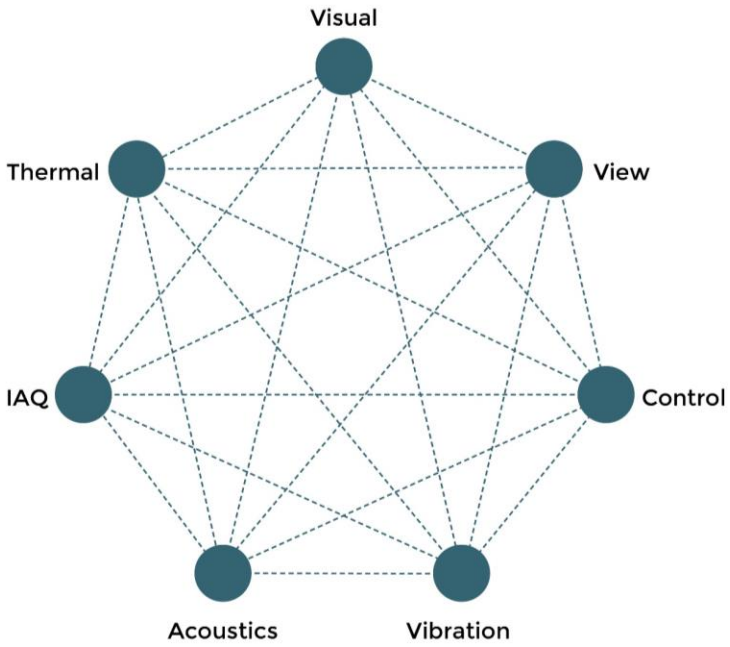
Indoor environmental quality

In the IEQ literature, comfort is viewed from a physiological-technological perspective and described through visual , thermal , acoustical and air quality parameters.

(Bluyssen, 2009)

Introduction

Indoor environmental quality



Multi-domain comfort of occupants: Drawn by author based on Luna-Navarro (2021)

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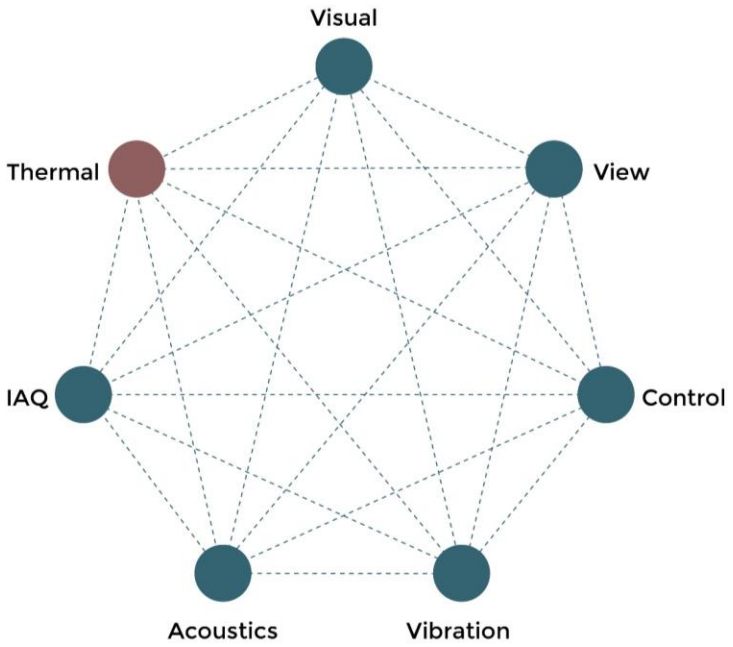
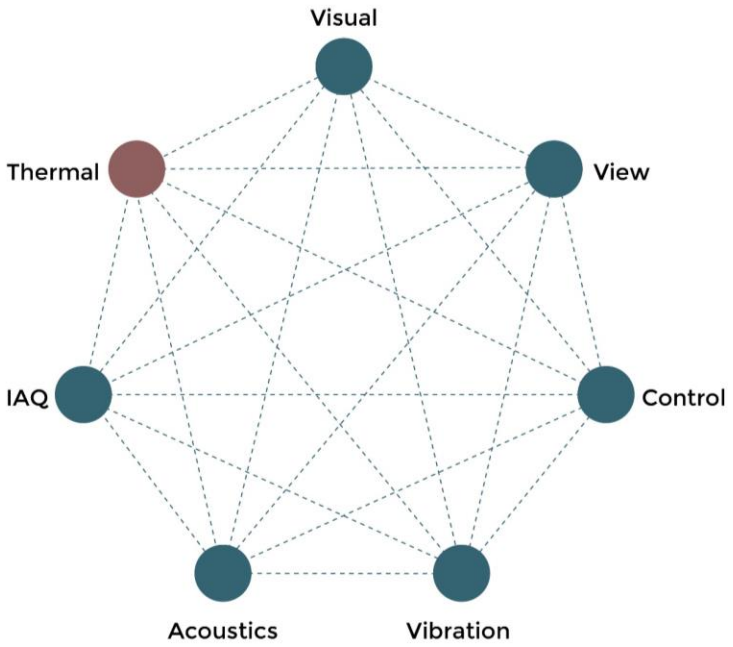
Indoor environmental quality

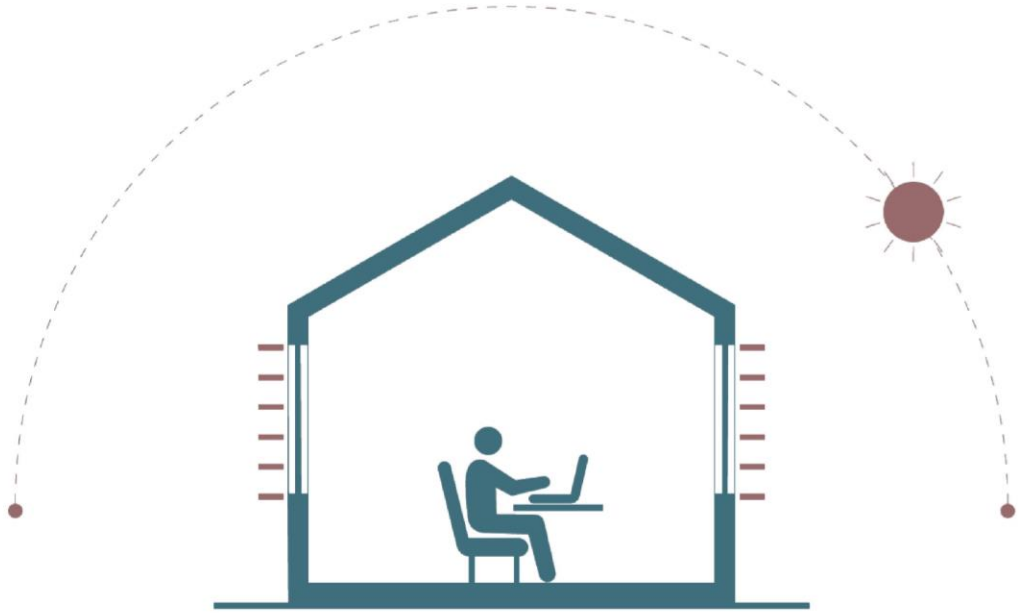


Insulation

Introduction

Indoor environmental quality

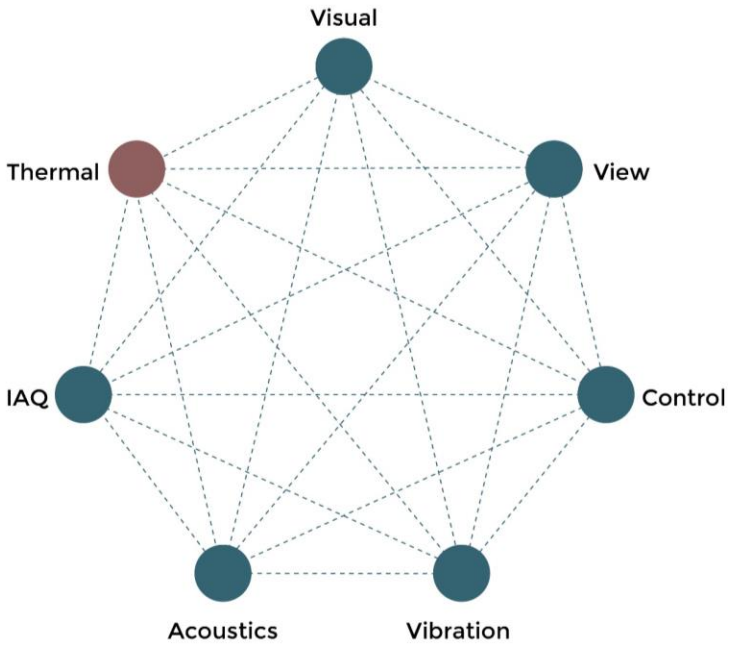




Solar Heat Gain Coefficient

Introduction

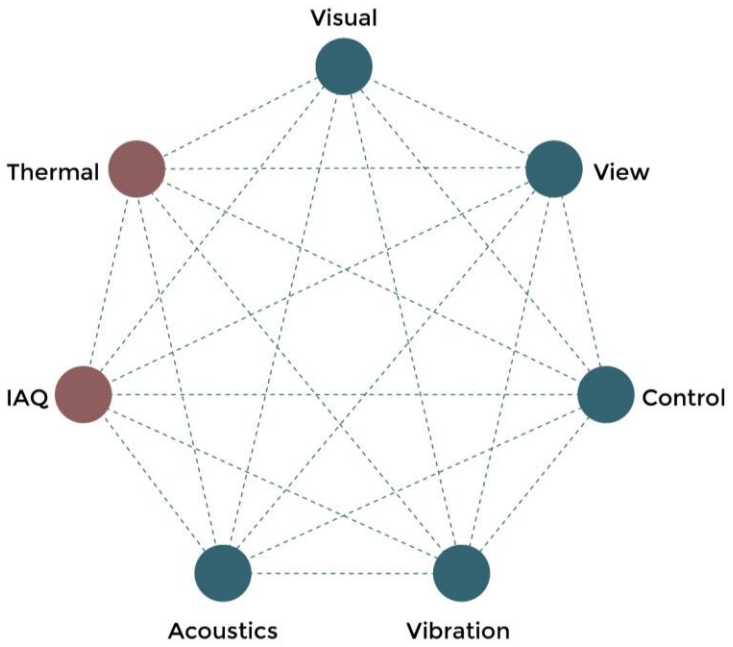
Indoor environmental quality



Thermal inertia

Introduction

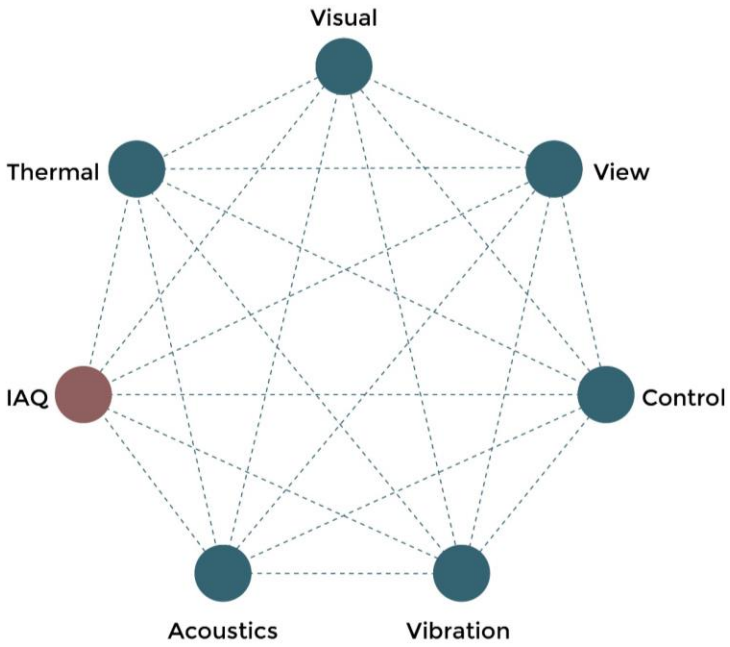
Indoor environmental quality



Air tightness

Introduction

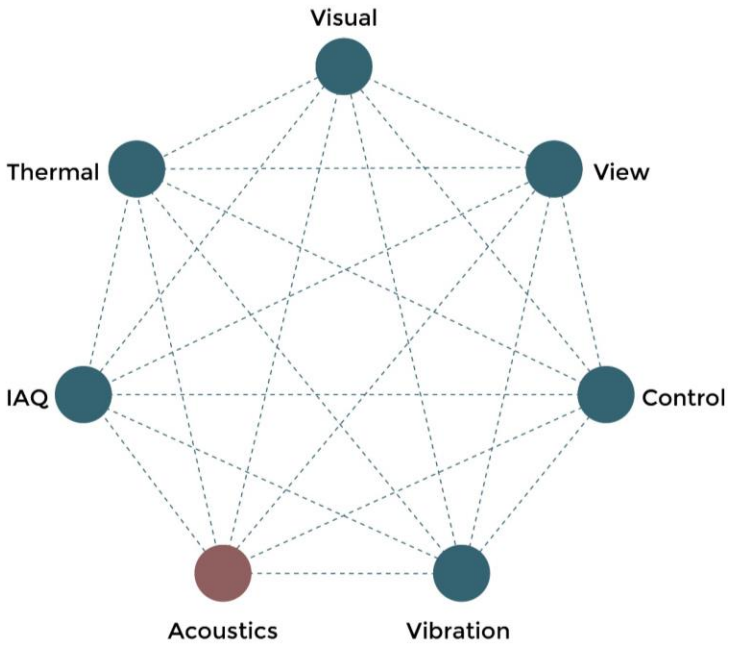
Indoor environmental quality



Ventilation

Introduction

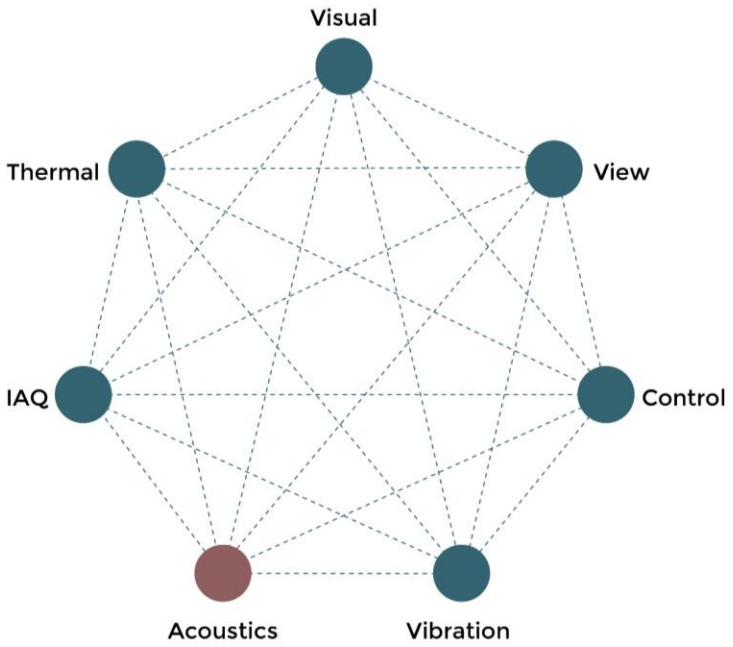
Indoor environmental quality



Acoustic insulation

Introduction

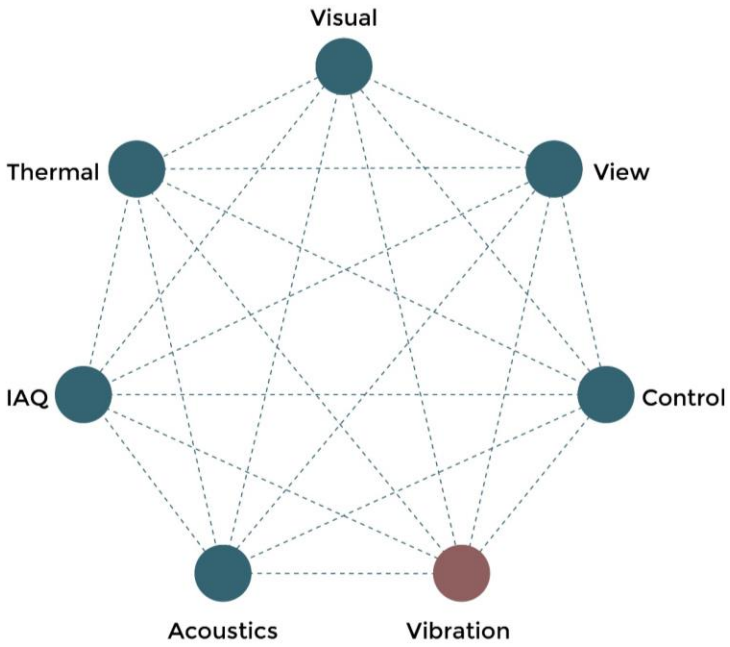
Indoor environmental quality



Operational noise

Introduction

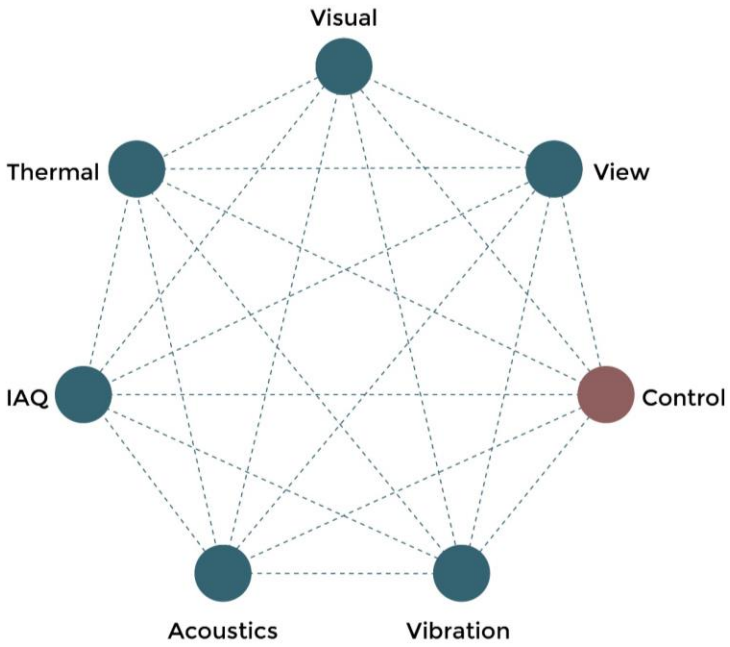
Indoor environmental quality

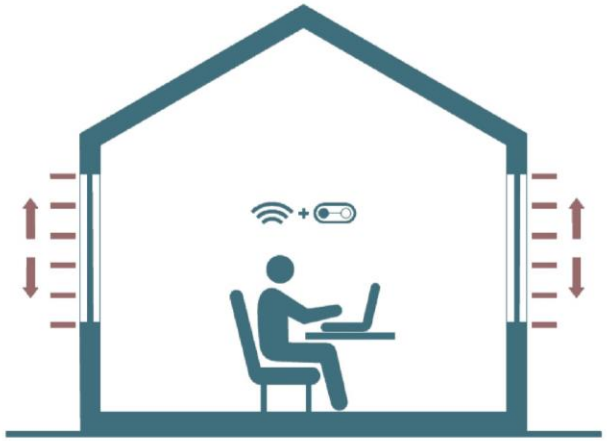


Vibrations

Introduction

Indoor environmental quality





Control

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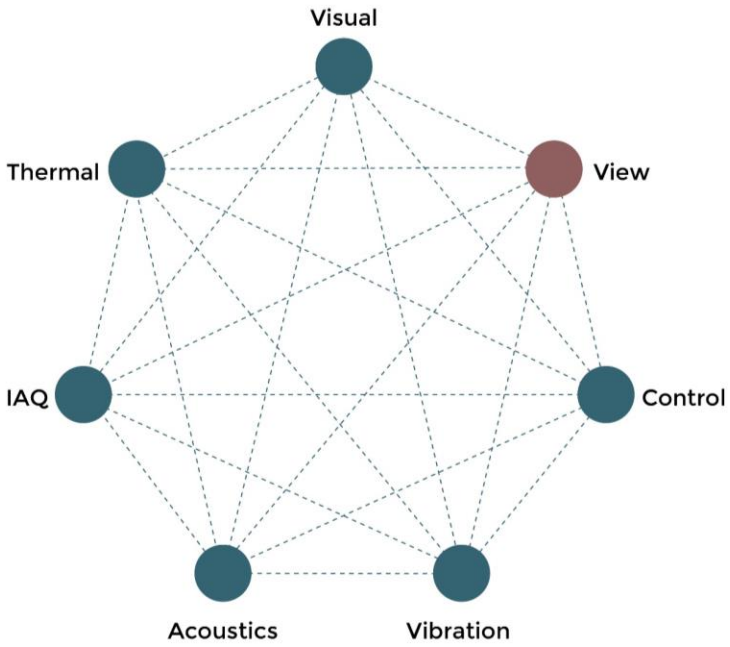
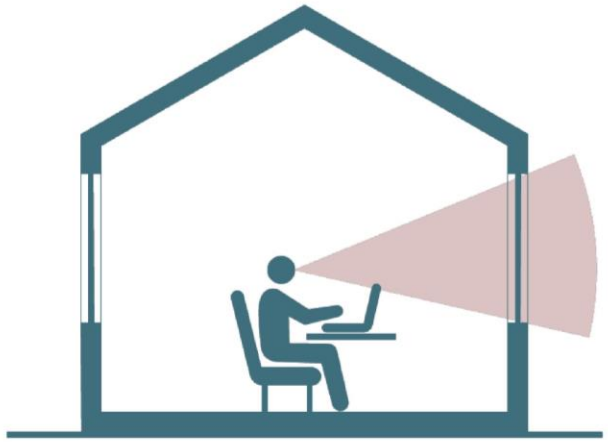
Indoor environmental quality

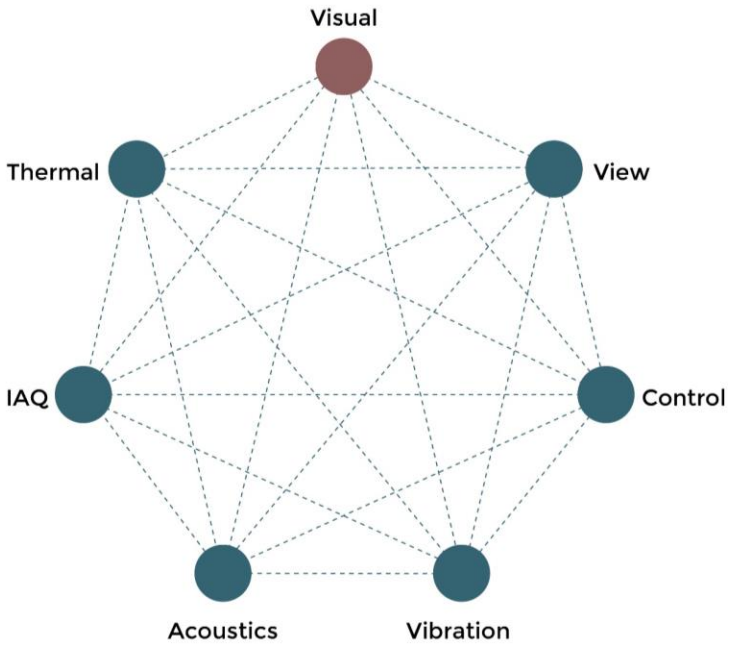




View Quality

Introduction

Indoor environmental quality



Daylight availability

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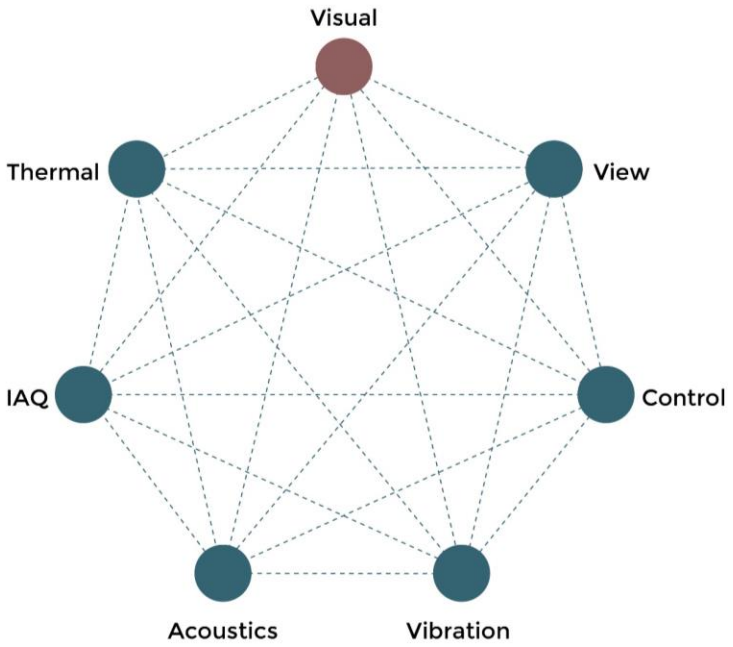
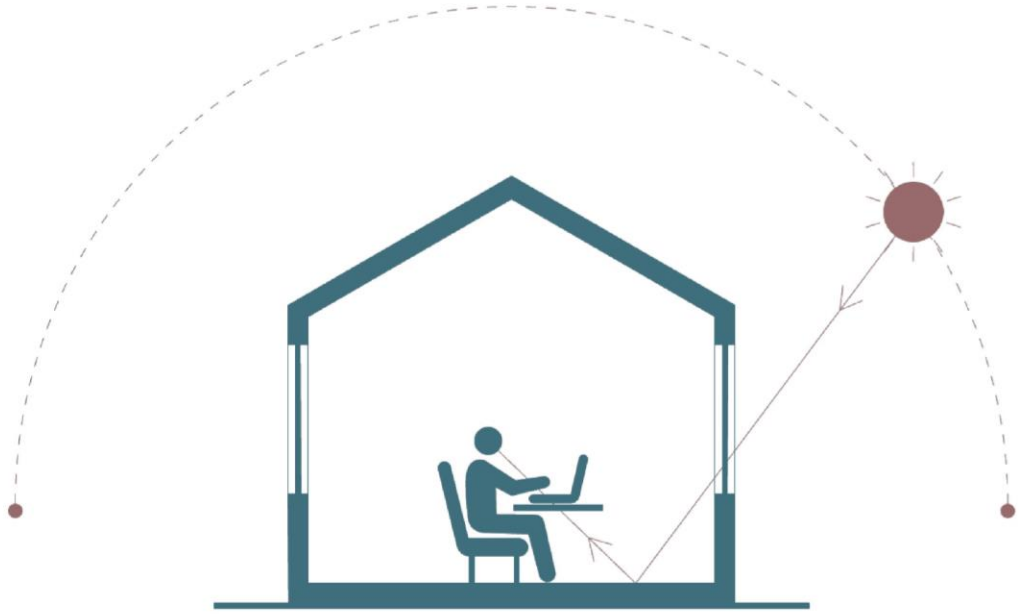
Indoor environmental quality





Glare

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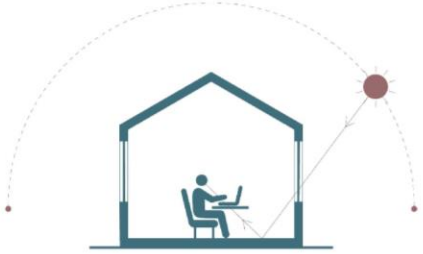

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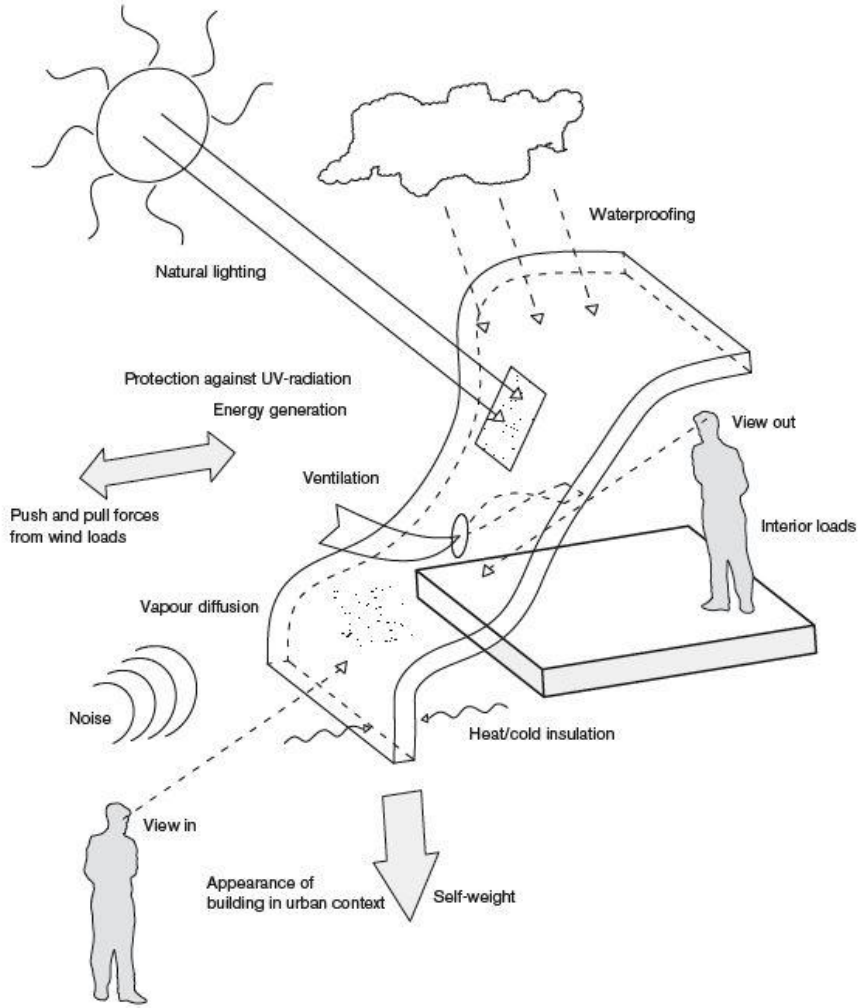

Influence of Facades on indoor environmental quality
(Source: Knaack et al. (2018)

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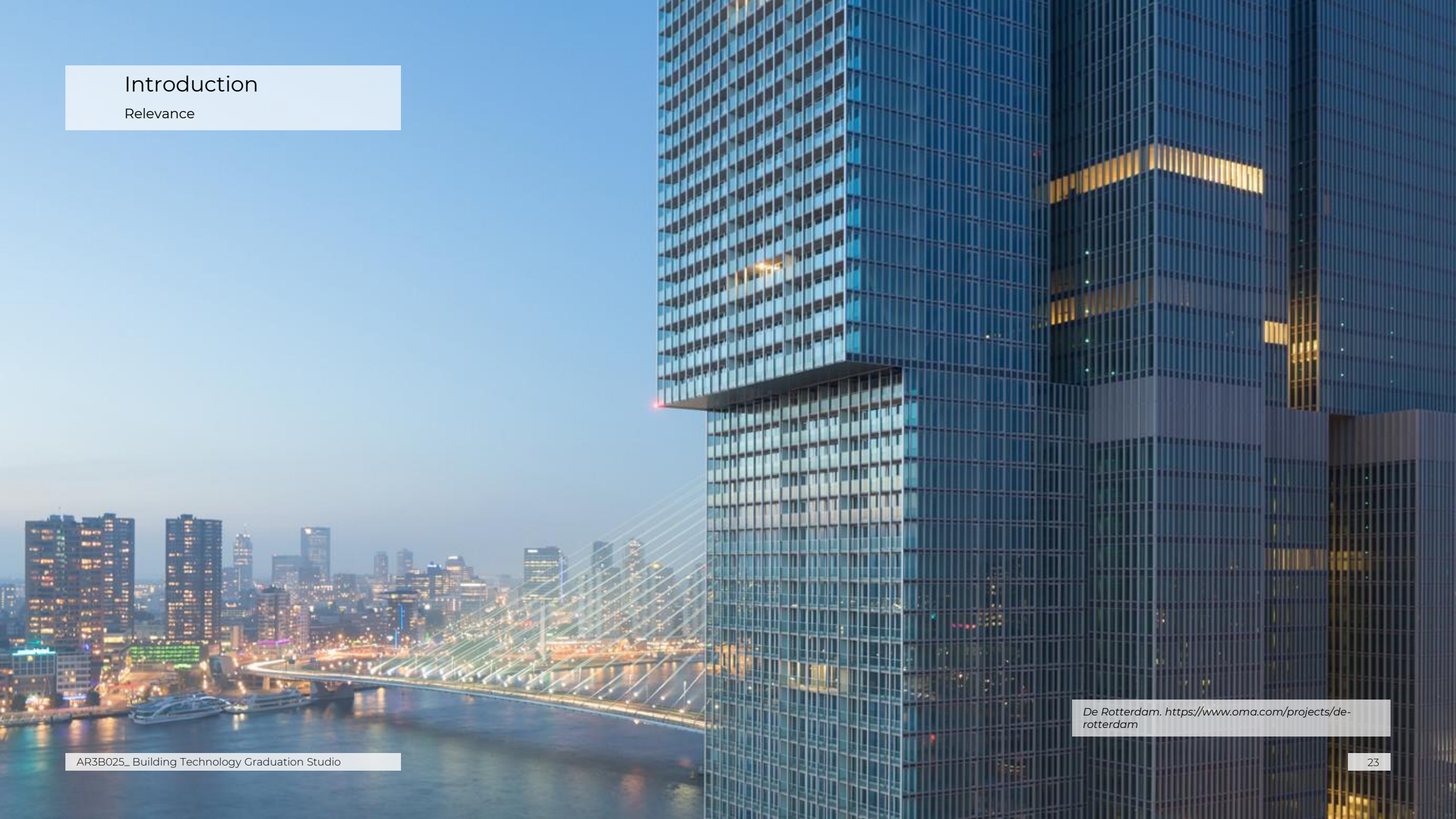
Relevance



De Rotterdam. https://www.oma.com/projects/de-rotterdam

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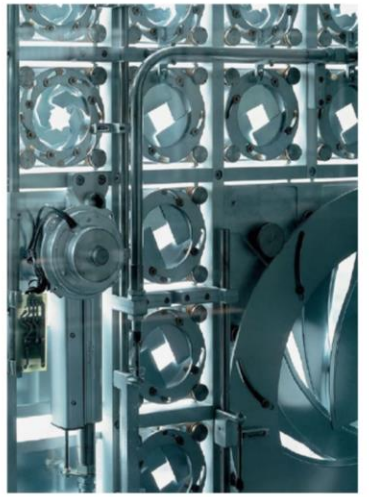
Shading Technologies






Shading Technologies Herzog, Krippner, and Lang (2012)

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Shading Technologies

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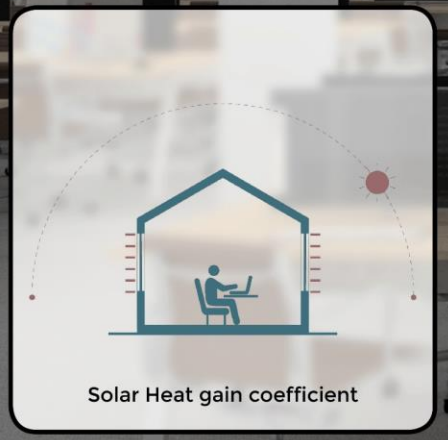
Shading Technologies



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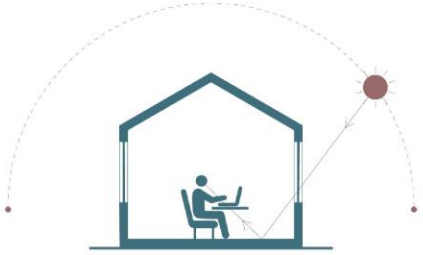

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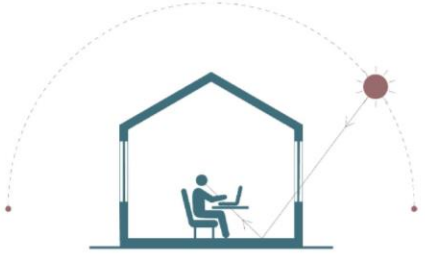

Glare

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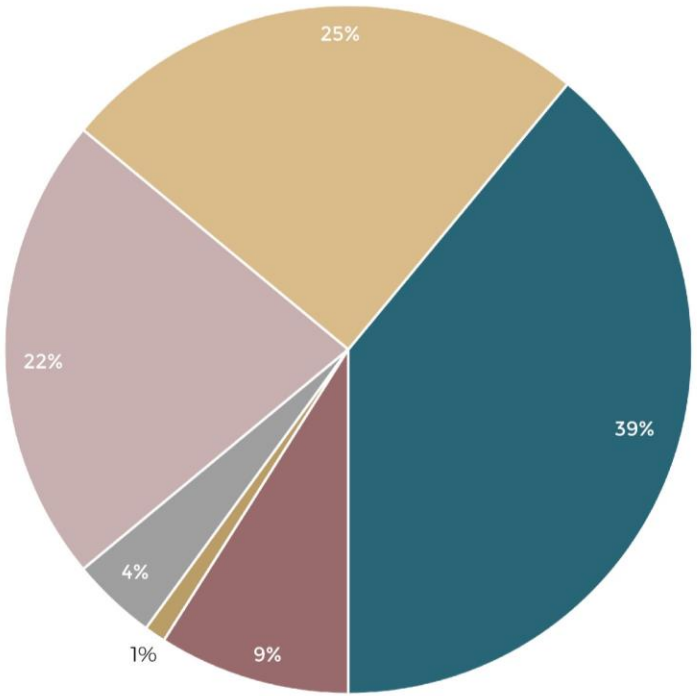
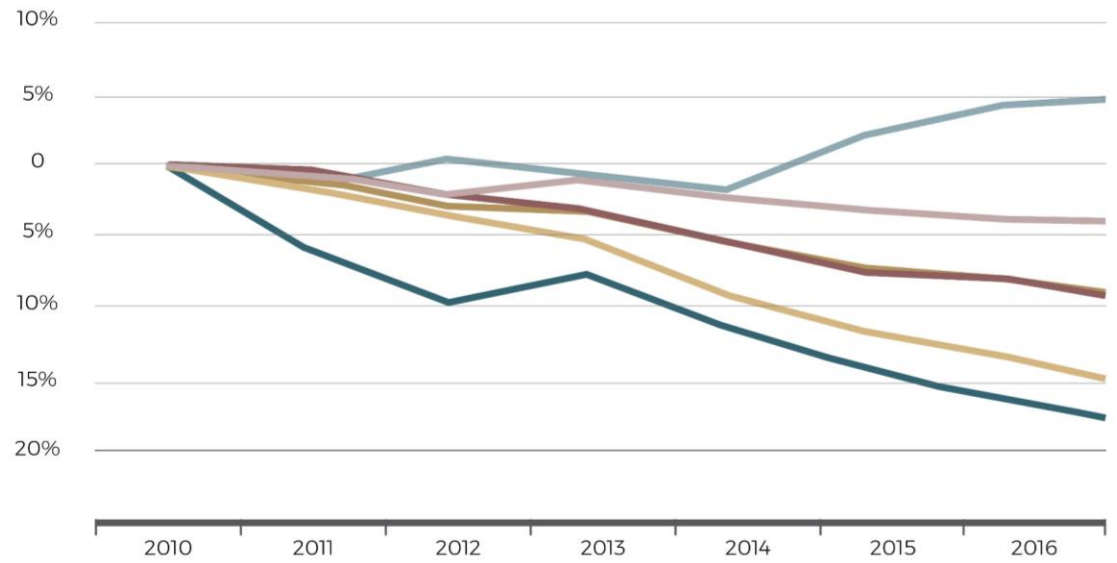
Energy impact





Space heating | Space cooling | Water heating | Lighting | Other | Appliances

Sector wise energy use (Source: IEA (2019)

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Shading Technologies

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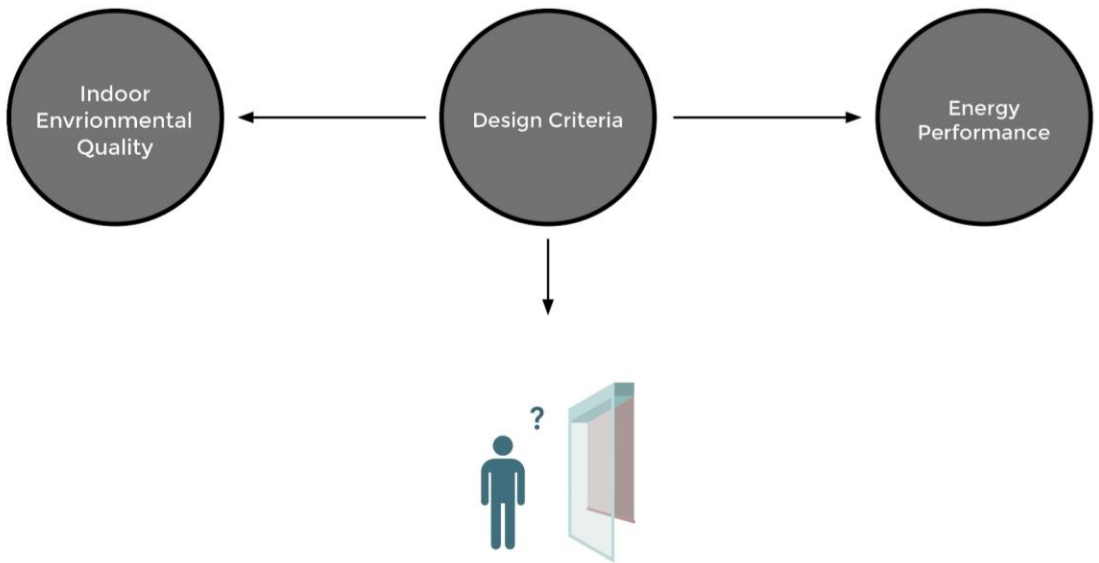

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Shading Technologies

Impact of desigining without occupant preferences

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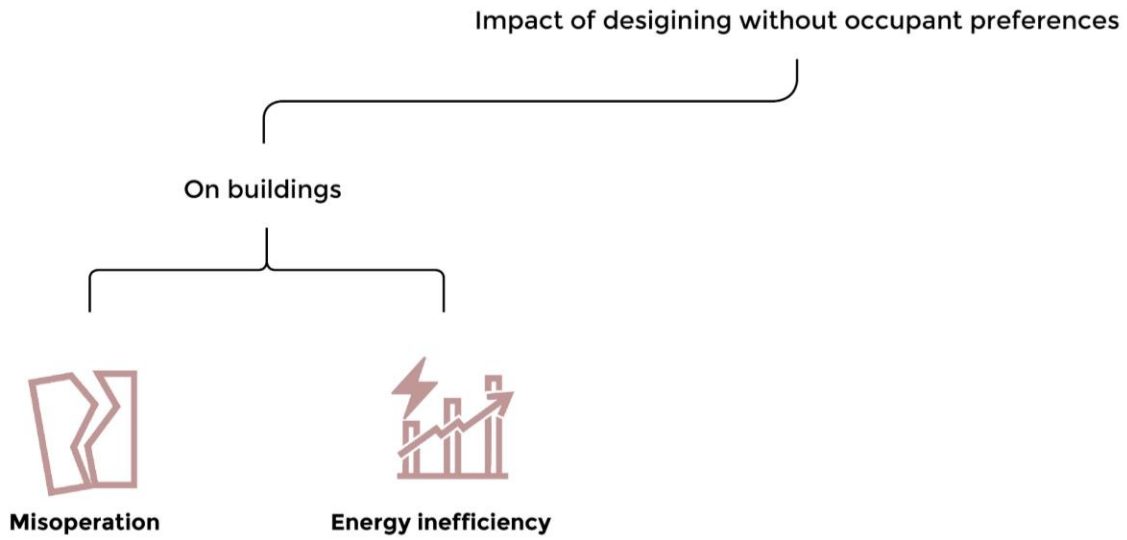
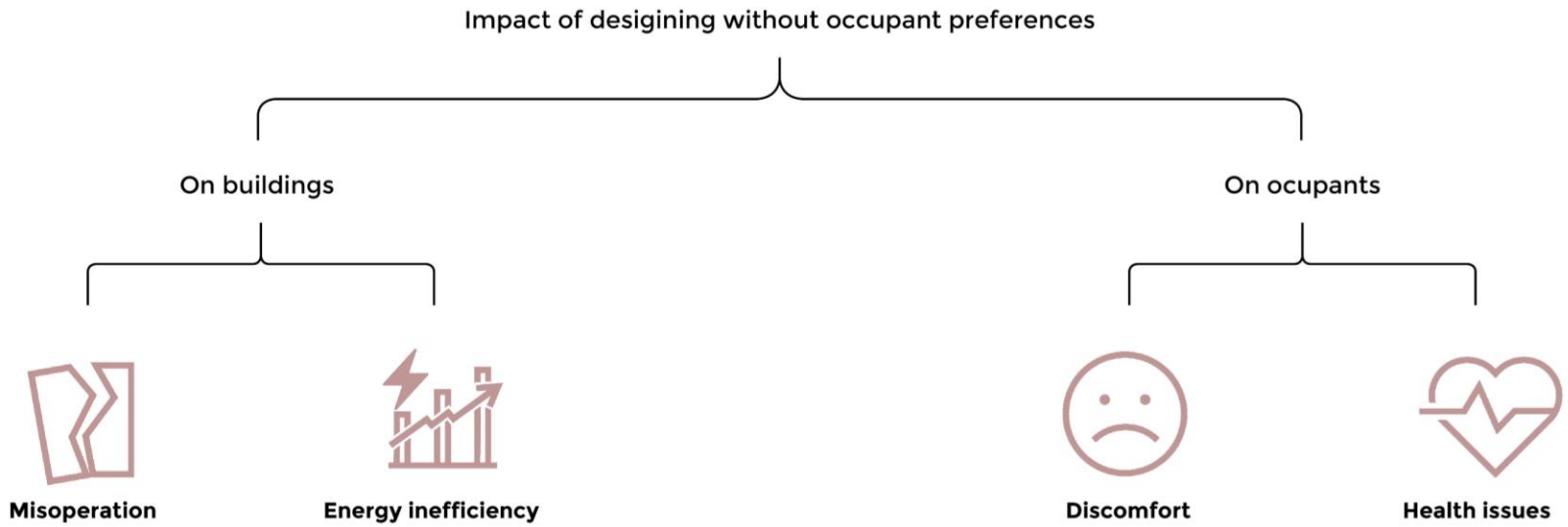
Shading Technologies



Introduction

Shading Technologies



Introduction

Problem statement

“Existing building shade design methods prioritize energy performance and comfort metrics but fail to describe the users' personal preferences for environmental factors and visual aesthetics.”

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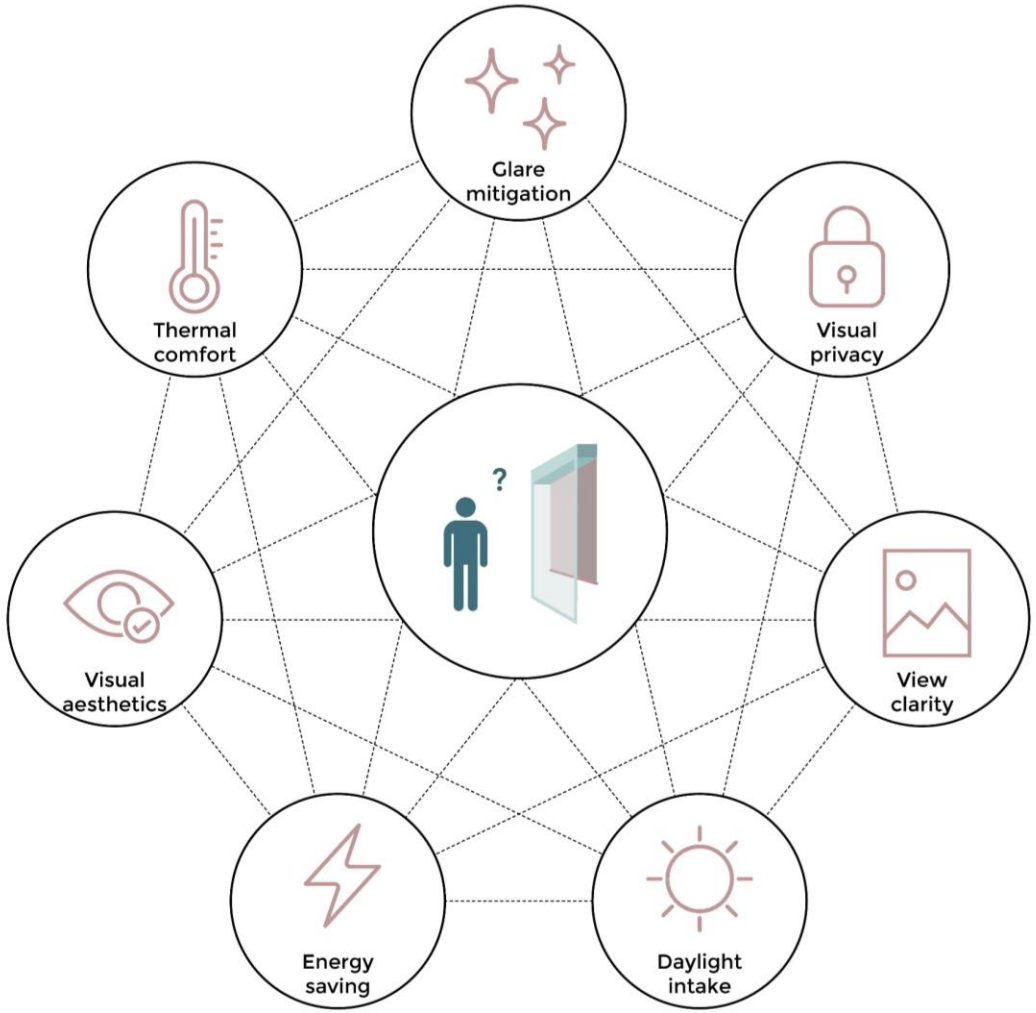
Problem statement



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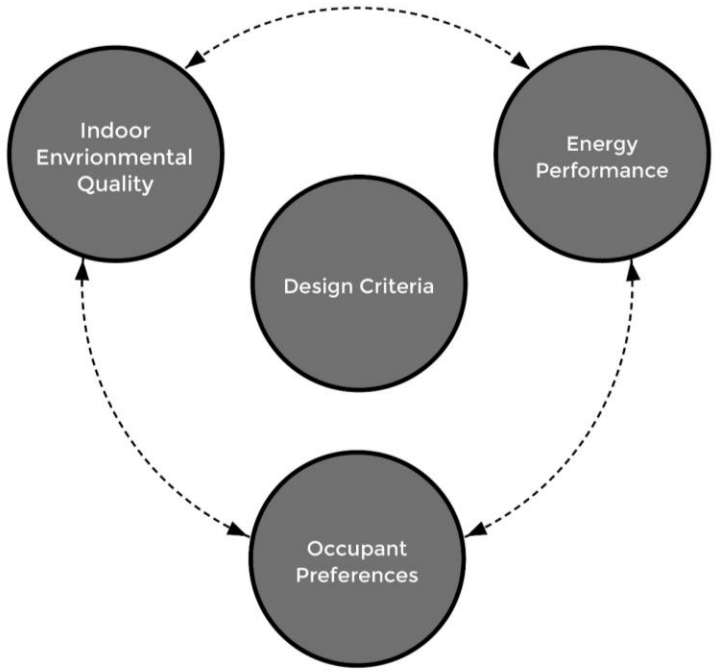

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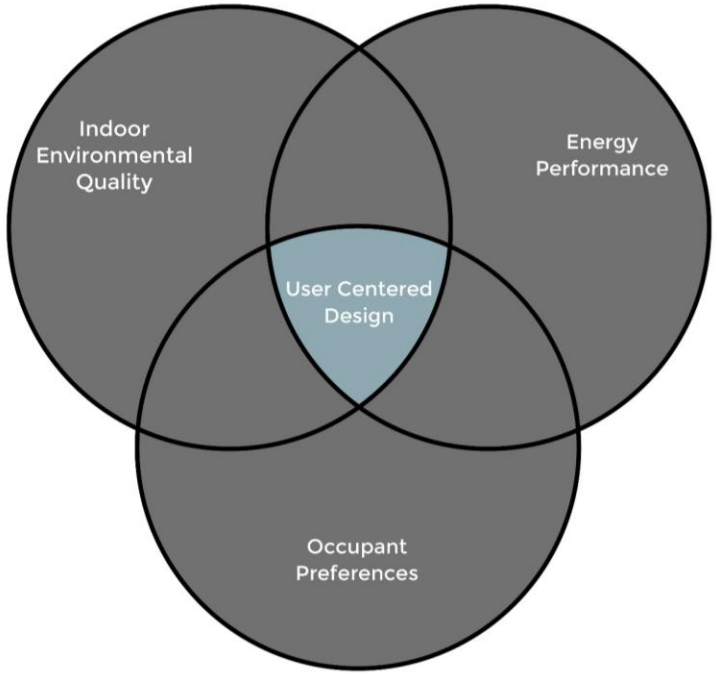

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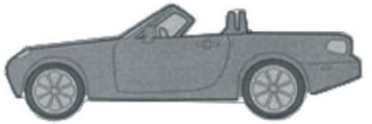
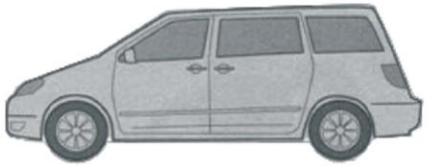




Archetypes for Design (Cooper 1990)

Introduction

Research Question

“How can manually operated shading solutions be personalized to provide occupant comfort and improve energy performance of buildings?”

Introduction

Research Question

What are the important shade parameters that need to be evaluated based on their effect on Indoor environmental quality and energy performance?

1

Introduction

Research Question

What are the important shade parameters that need to be evaluated based on their effect on Indoor environmental quality and energy performance? 1

What are the methods used to understand the impact of shading technologies? 2

Introduction

Research Question

1. *What are the important shade parameters that need to be evaluated based on their effect on Indoor environmental quality and energy performance?*

2. *What are the methods used to understand the impact of shading technologies?*

3. *What factors (personal and external) should be considered when evaluating user preferences for building shading systems?*

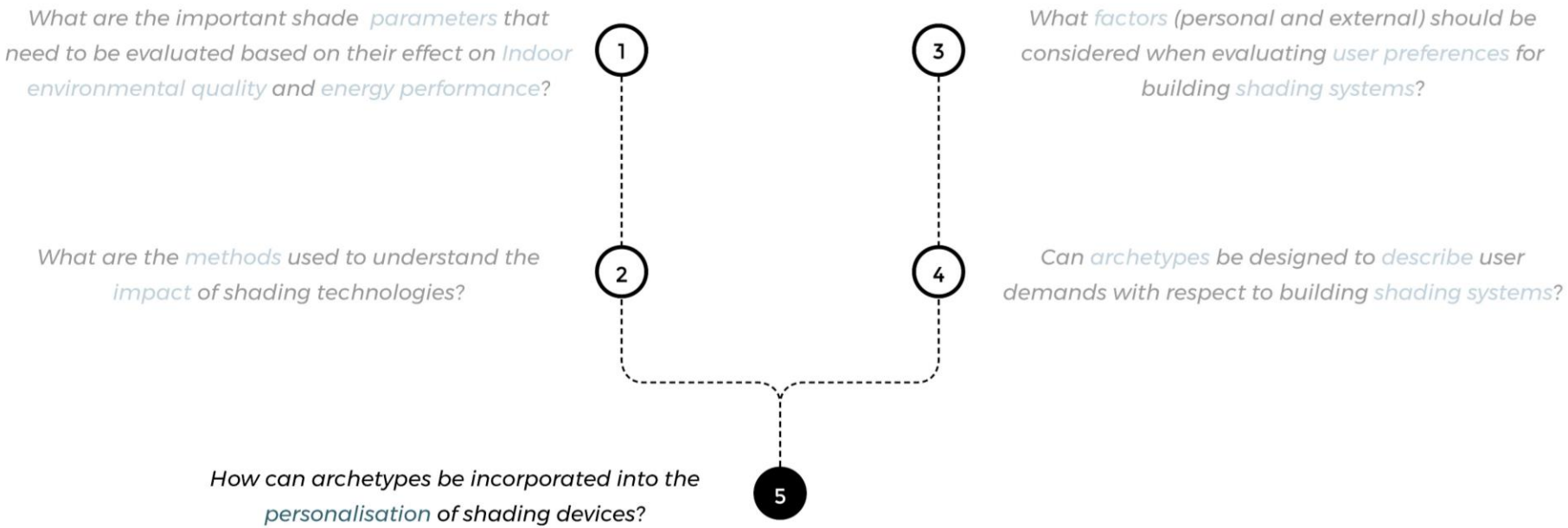
Introduction

Research Question

1. What are the important shade parameters that need to be evaluated based on their effect on Indoor environmental quality and energy performance?
2. What are the methods used to understand the impact of shading technologies?
3. What factors (personal and external) should be considered when evaluating user preferences for building shading systems?
4. Can archetypes be designed to describe user demands with respect to building shading systems?

Introduction

Research Question



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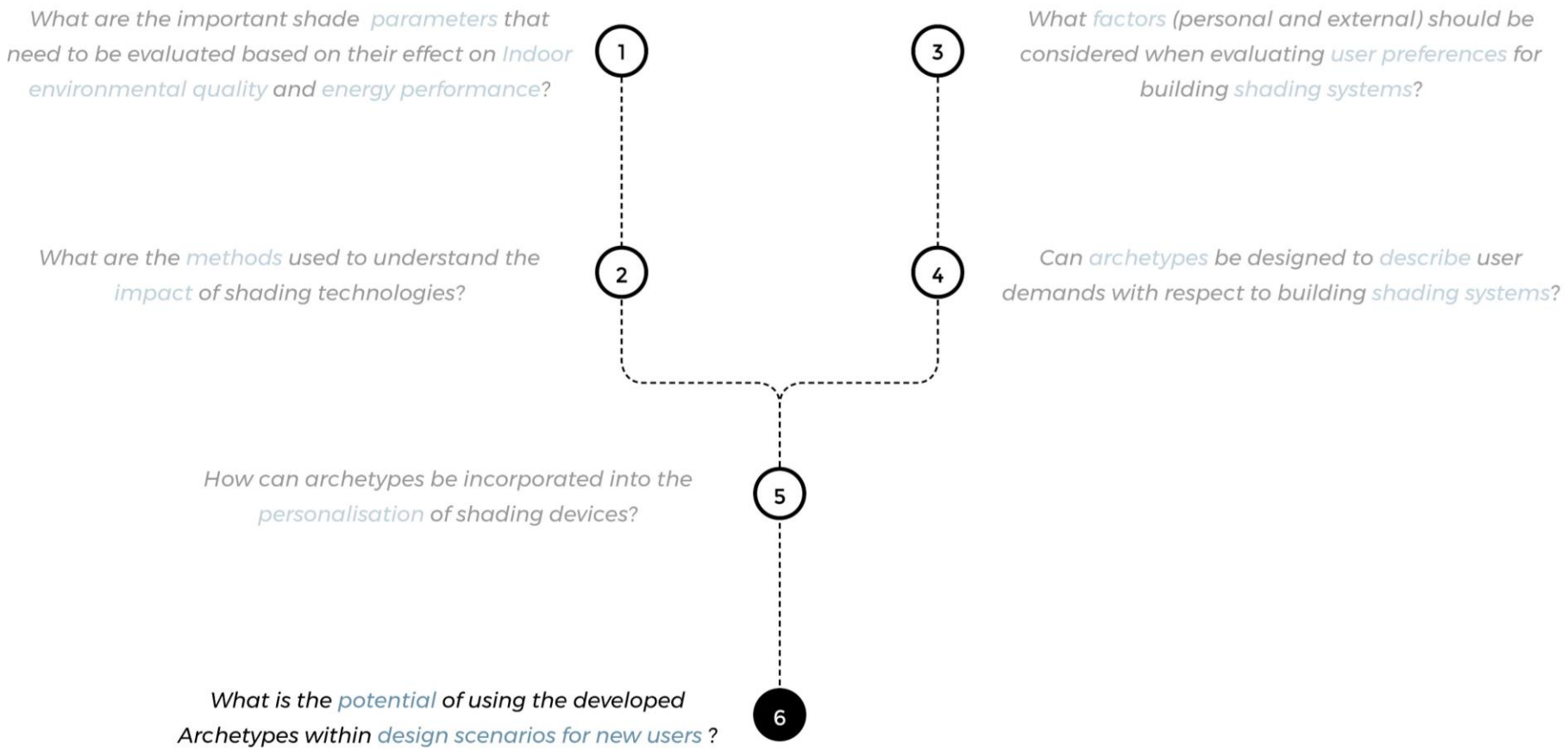
Research Question



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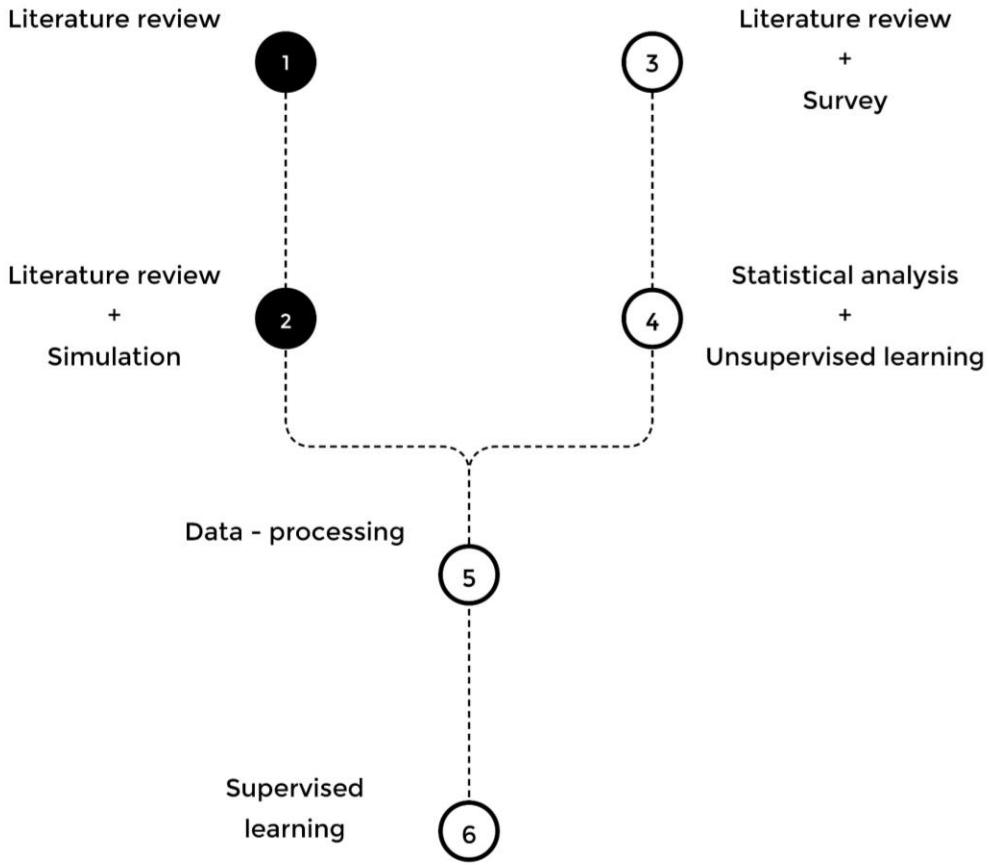
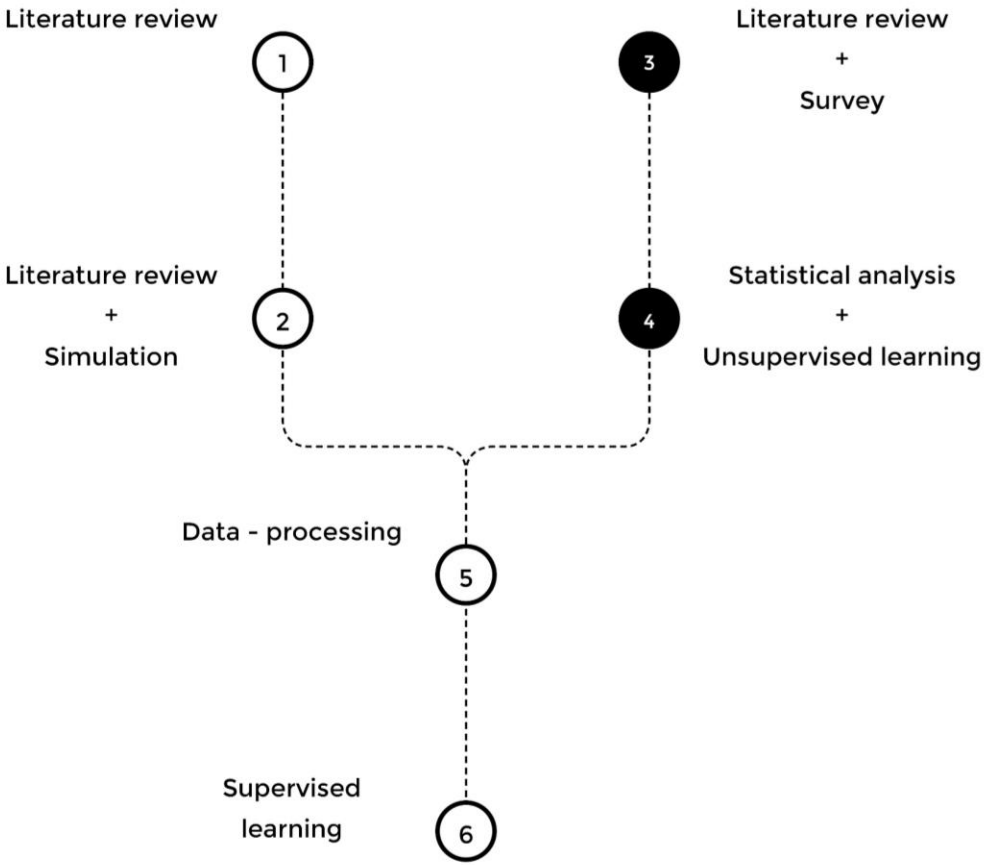
Methodology



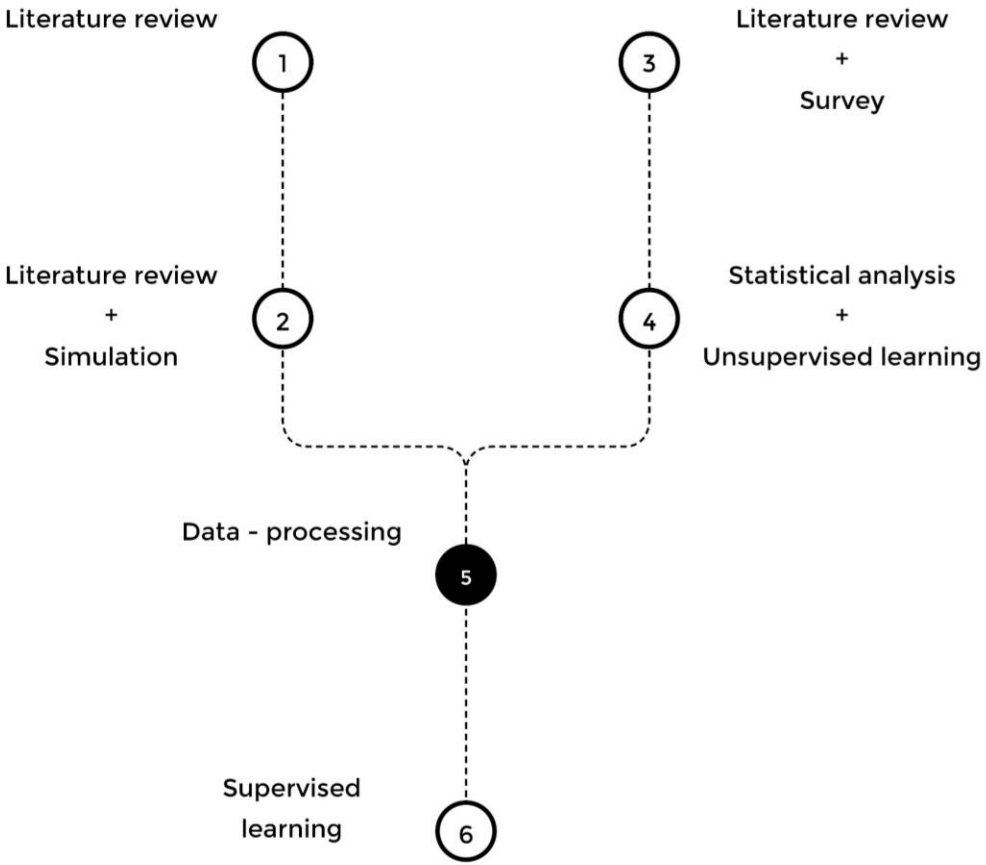
Introduction

Research Question



Introduction

Research Question



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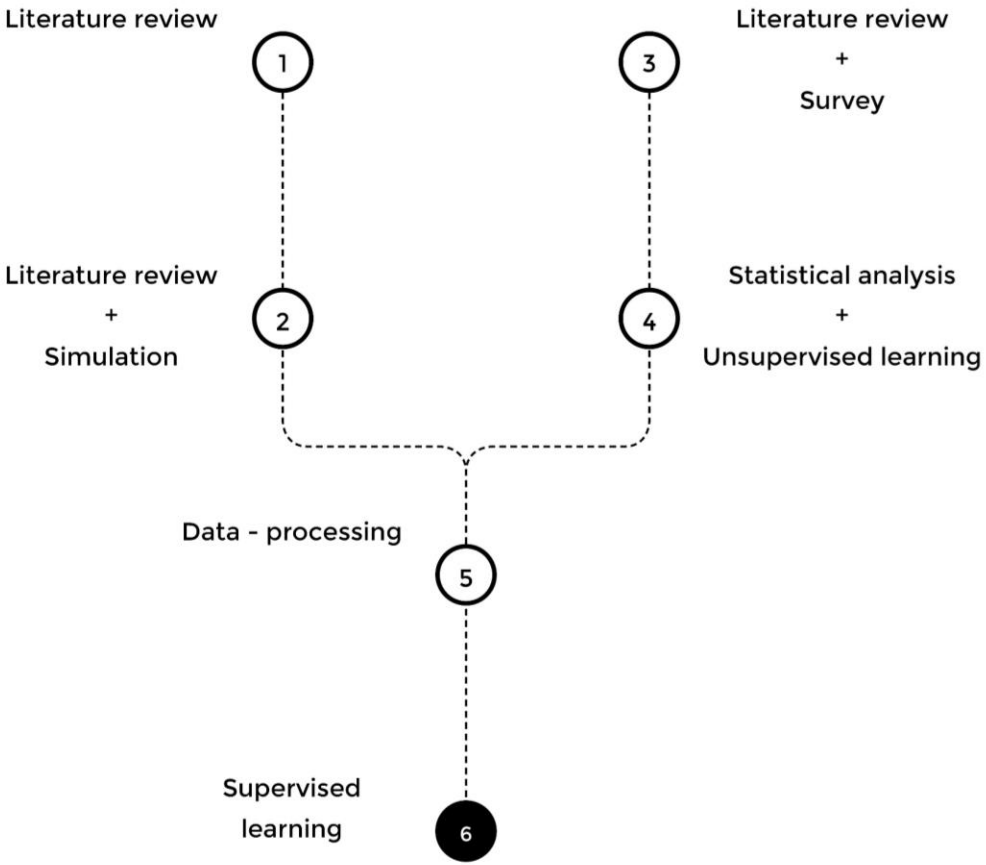
Research Question



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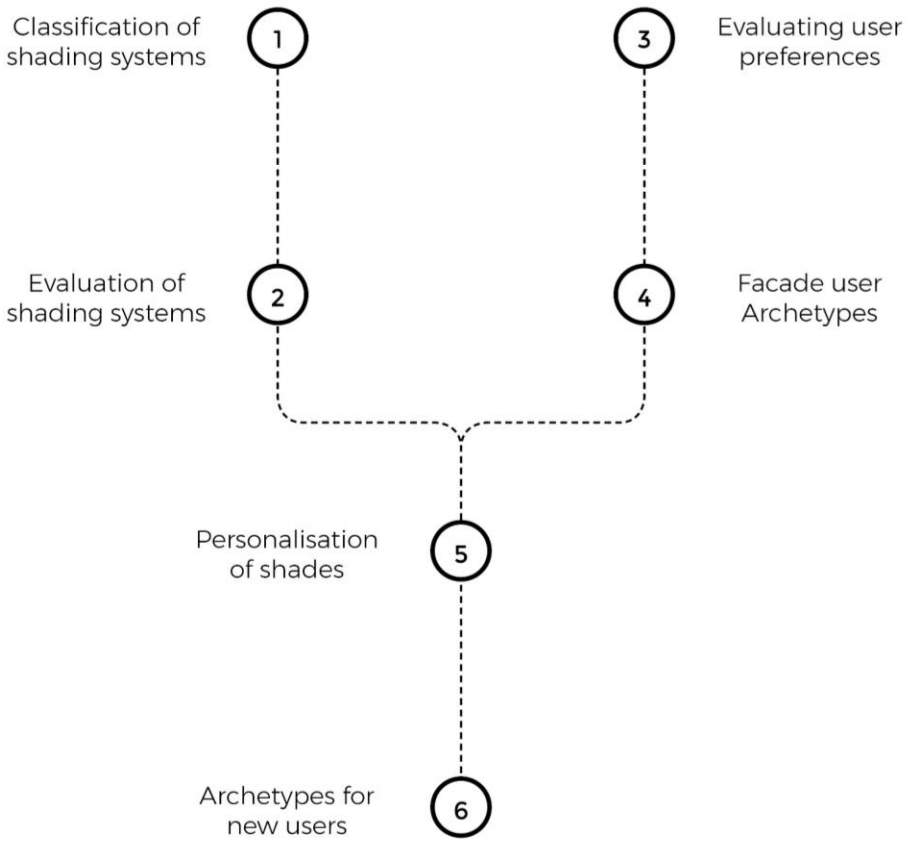
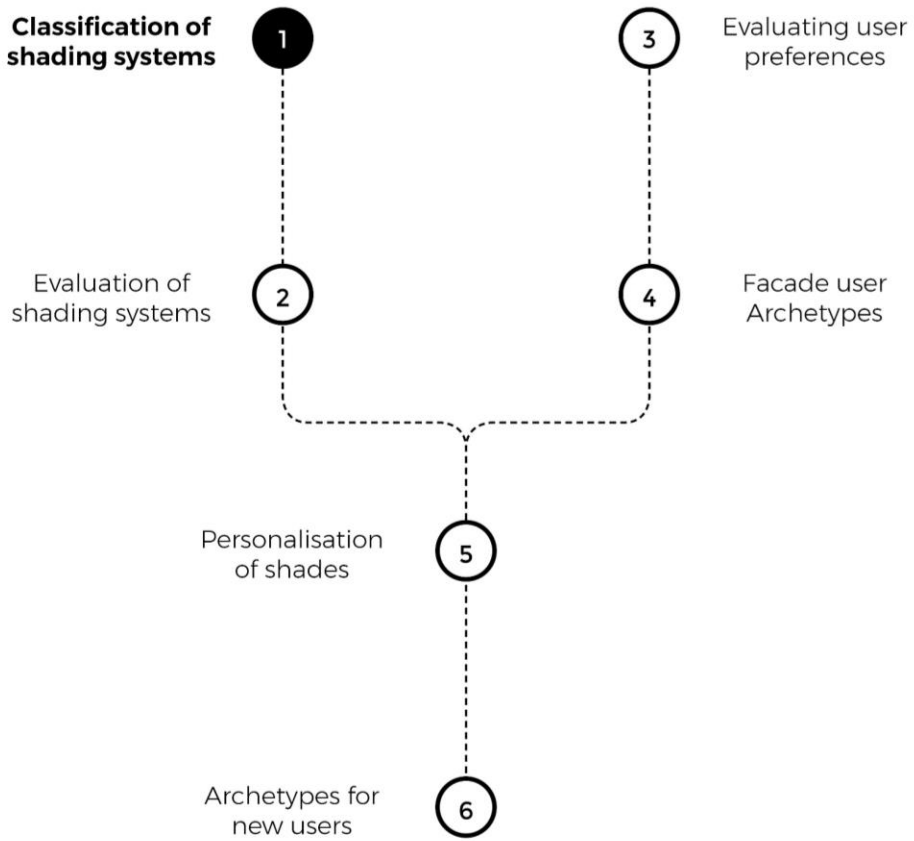
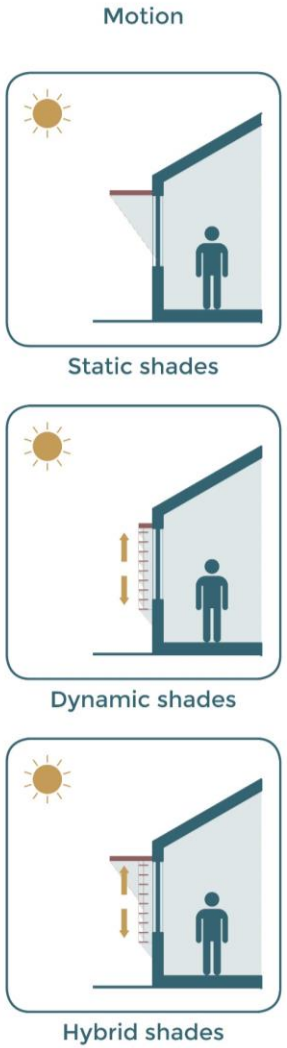
Methodology



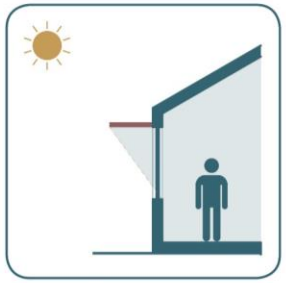

Classification of shading systems
1
3
Evaluating user preferences
Evaluation of shading systems
2
4
Facade user Archetypes
Personalisation of shades
5
Archetypes for new users
6

[01] Classification of shades

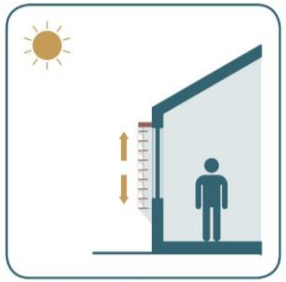


[01] Classification of shades

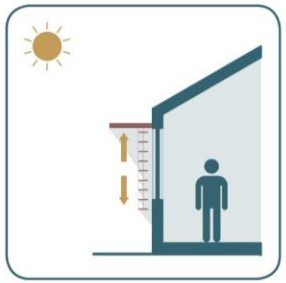
Motion



Static shades

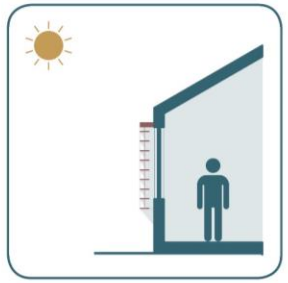


Dynamic shades

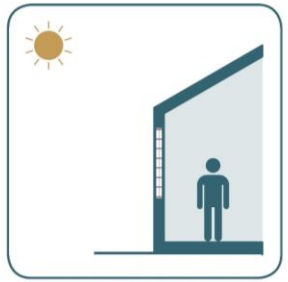


Hybrid shades

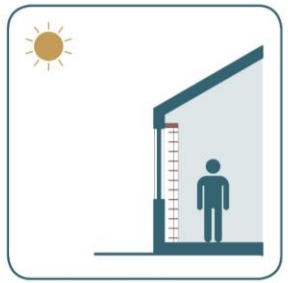
Placement



External shade



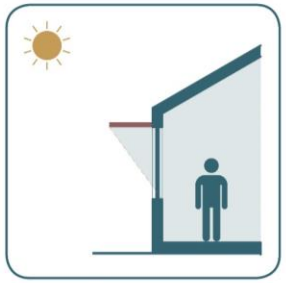
Intermediate shades



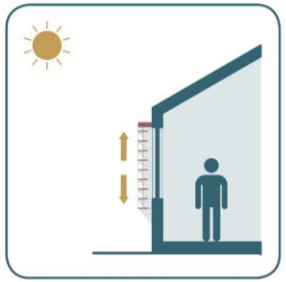
Internal shades

[01] Classification of shades

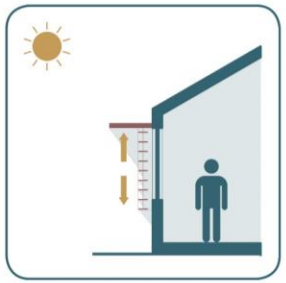
Motion



Static shades

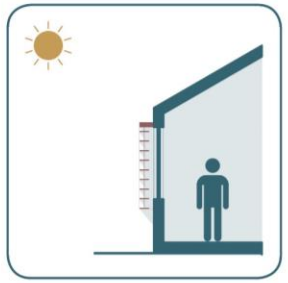


Dynamic shades

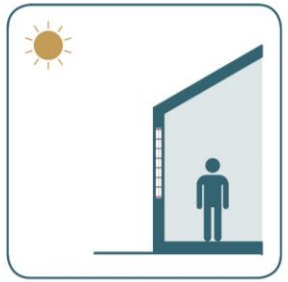


Hybrid shades

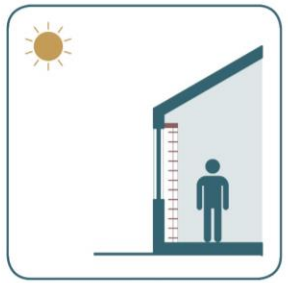
Placement



External shade

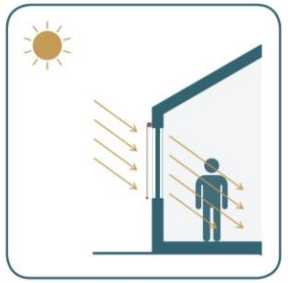


Intermediate shades

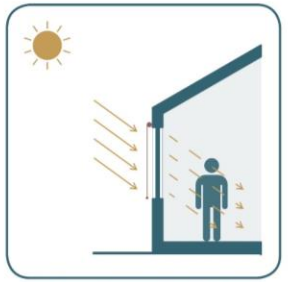


Internal shades

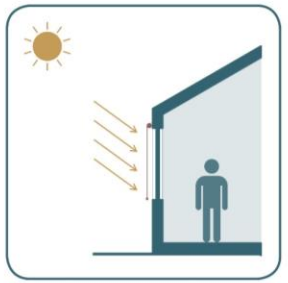
Permeability



Permeable



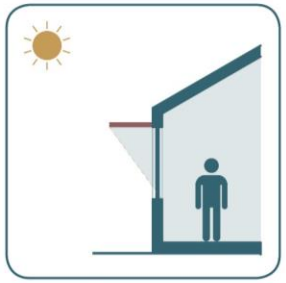
Semi permeable



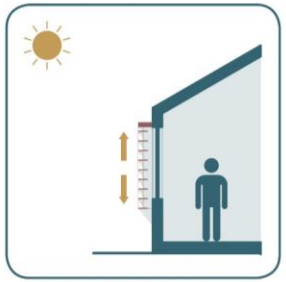
Impermeable

[01] Classification of shades

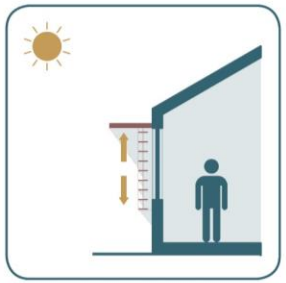
Motion



Static shades

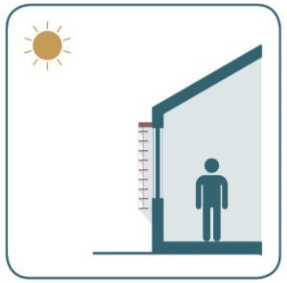


Dynamic shades

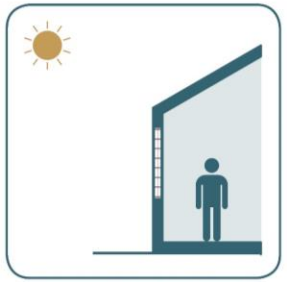


Hybrid shades

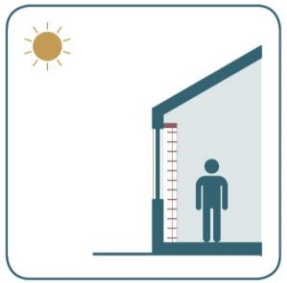
Placement



External shade

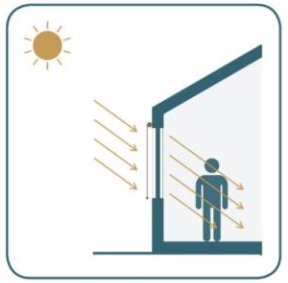


Intermediate shades

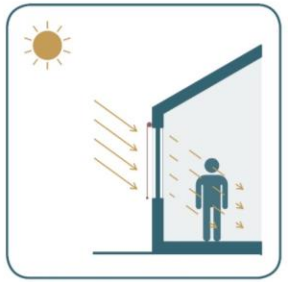


Internal shades

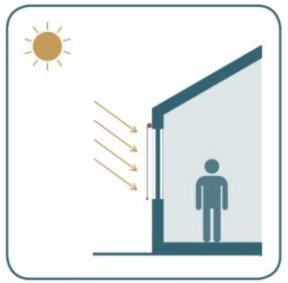
Permeability



Permeable

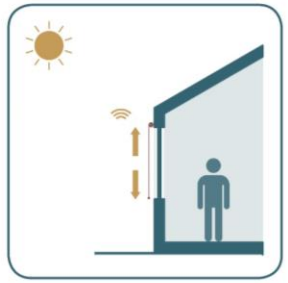


Semi permeable

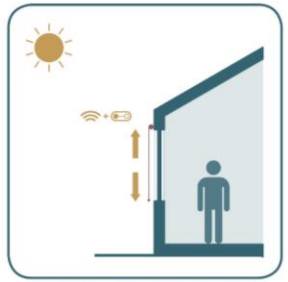


Impermeable

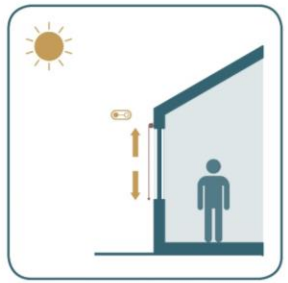
Control



Automatic shades



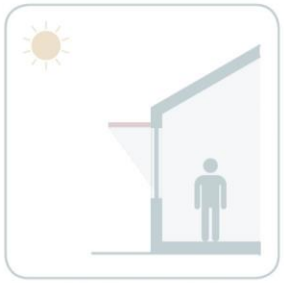
Hybrid shades



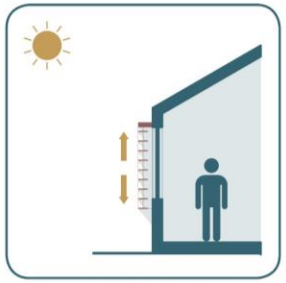
Manual shades

[01] Classification of shades

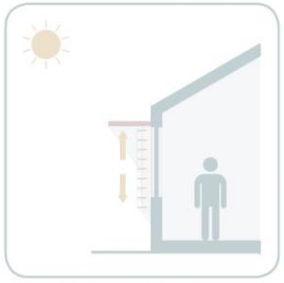
Motion



Static shades

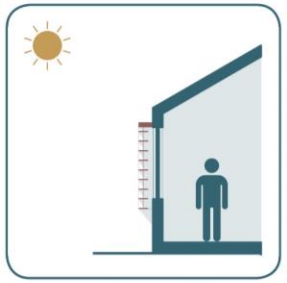


Dynamic shades

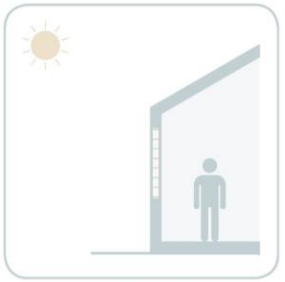


Hybrid shades

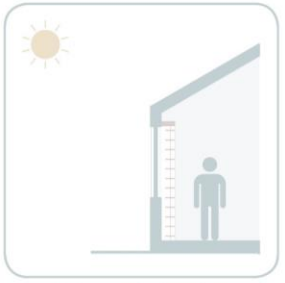
Placement



External shade

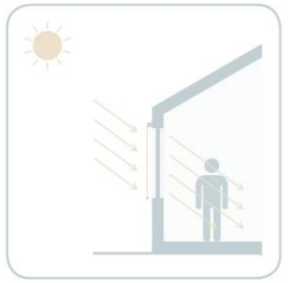


Intermediate shades

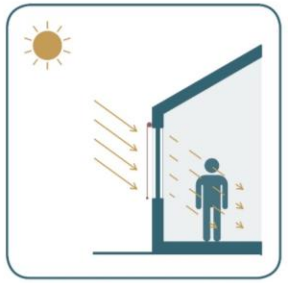


Internal shades

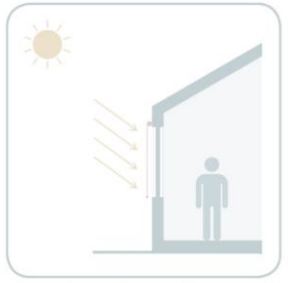
Permeability



Permeable

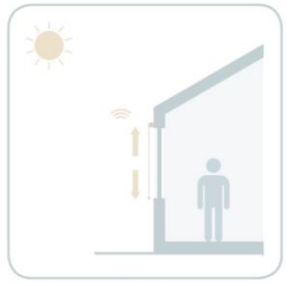


Semi permeable

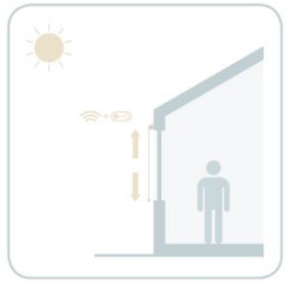


Impermeable

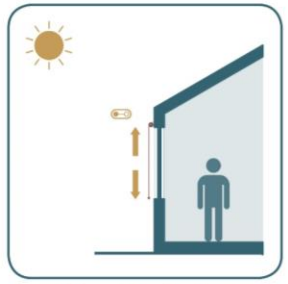
Control



Automatic shades



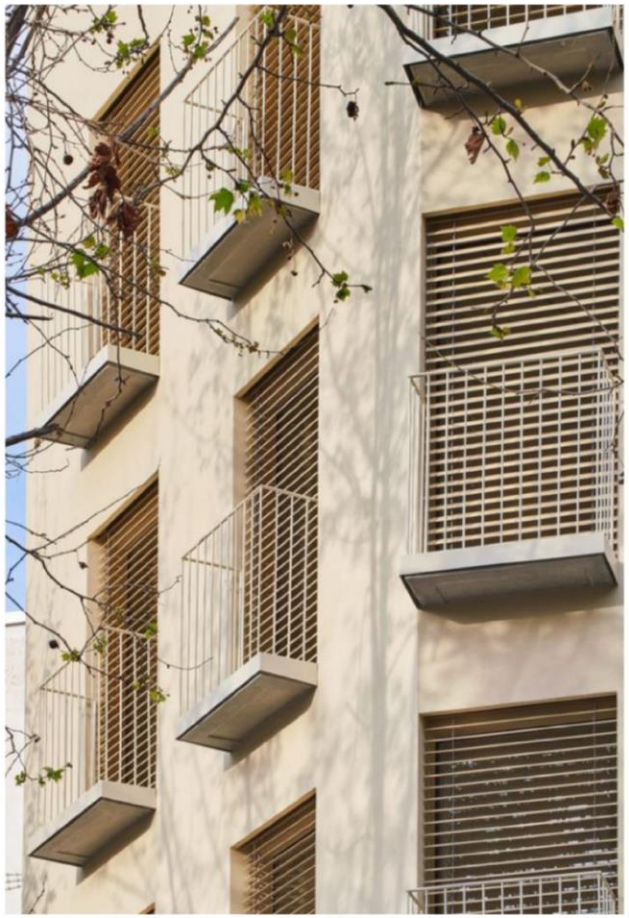
Hybrid shades

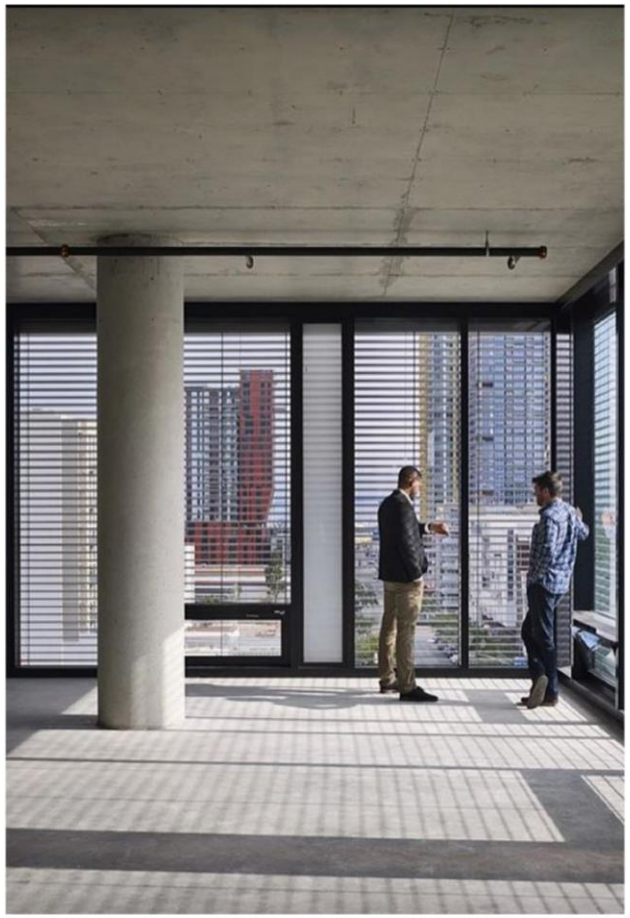


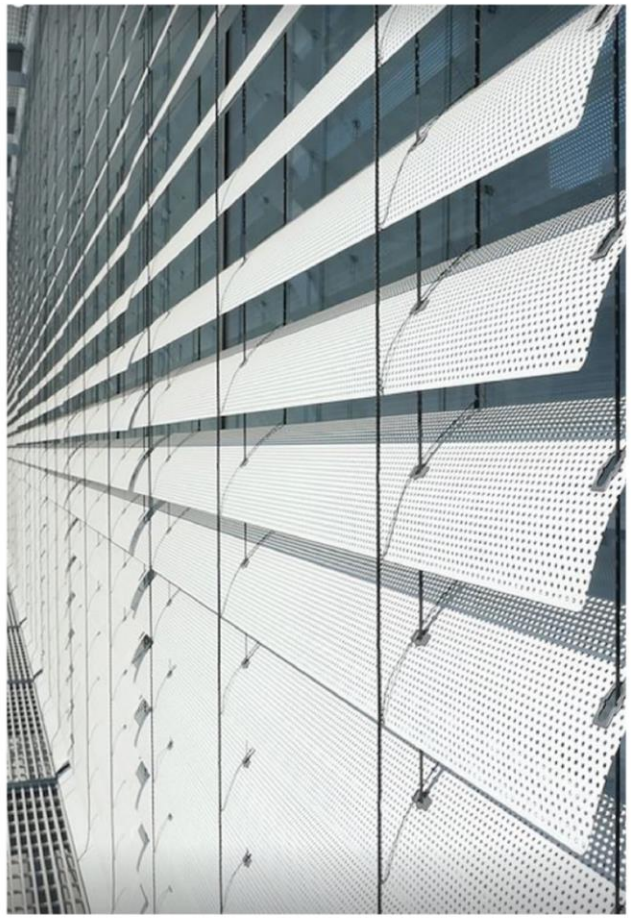
Manual shades

[01] Classification of shades

Venetian blinds



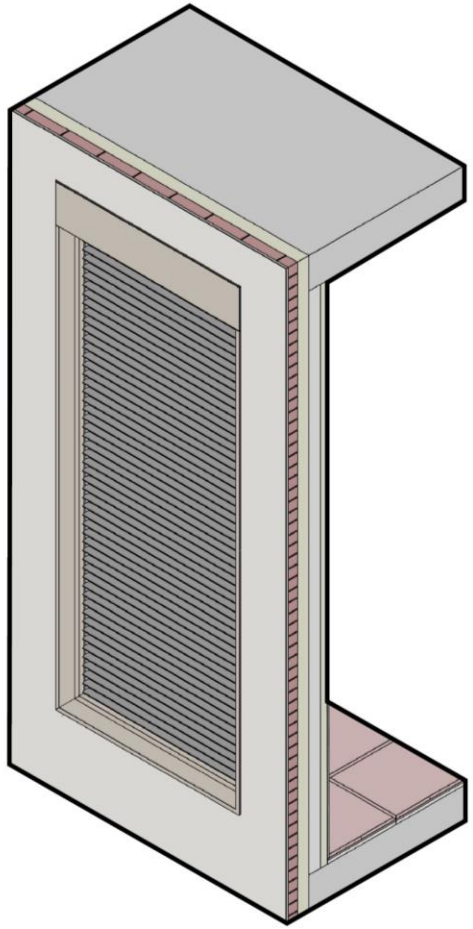


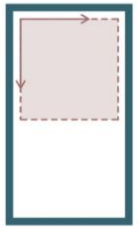


Views of residential building with venetian blinds (Source: Archdaily)

[01] Classification of shades

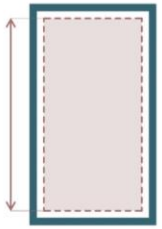
Venetian blind parameters





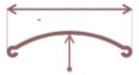
Shade area

%



Shade state

Open / Close

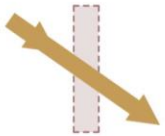


Slat profile

Profile and width (mm)

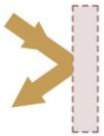
Slat angle

Degrees



Transmittance

0 to 1



Reflectance

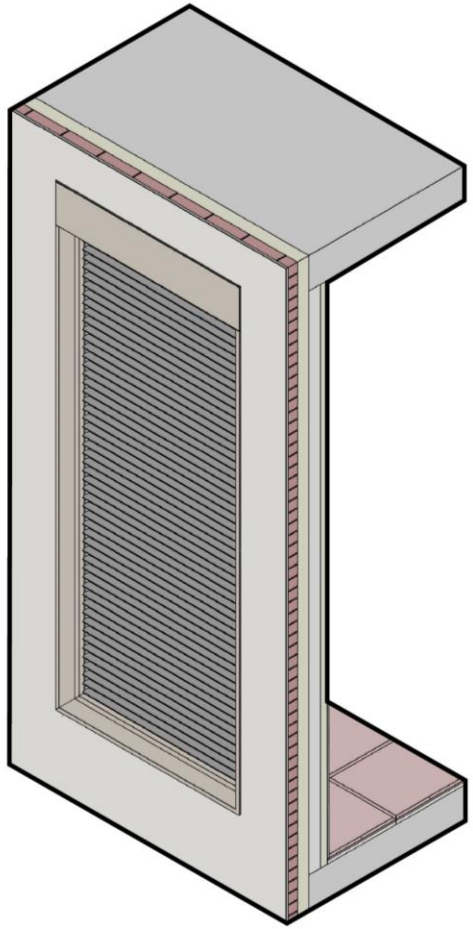
0 to 1

Absorptance

0 to 1

[01] Classification of shades

Venetian blind parameters

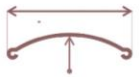


Shade area

%

Shade state

Open / Close

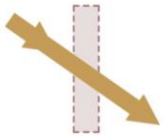


Slat profile

Profile and width (mm)

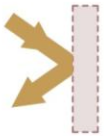
Slat angle

Degrees



Transmittance

0 to 1



Reflectance

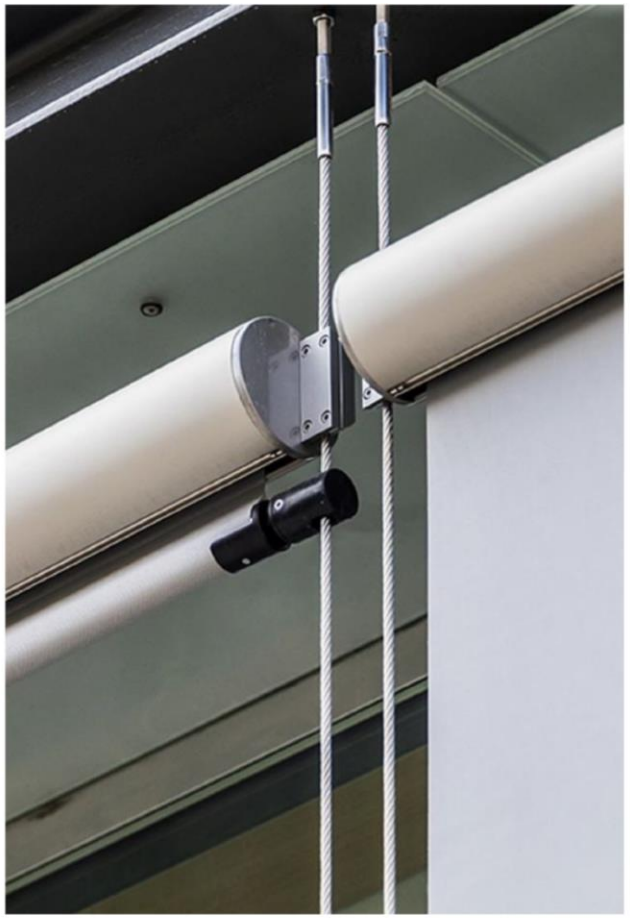
0 to 1

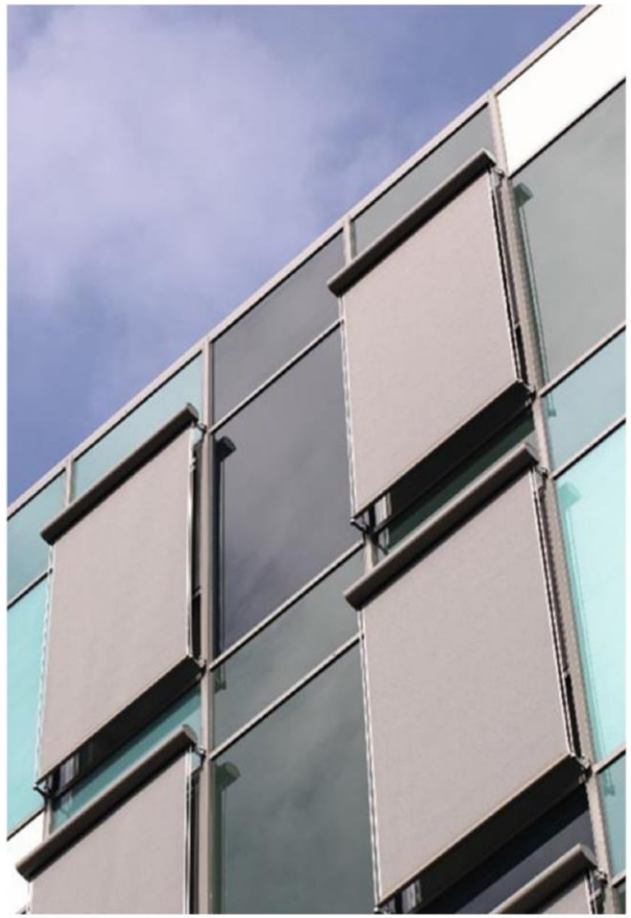
Absorptance

0 to 1

[01] Classification of shades

Roller shades

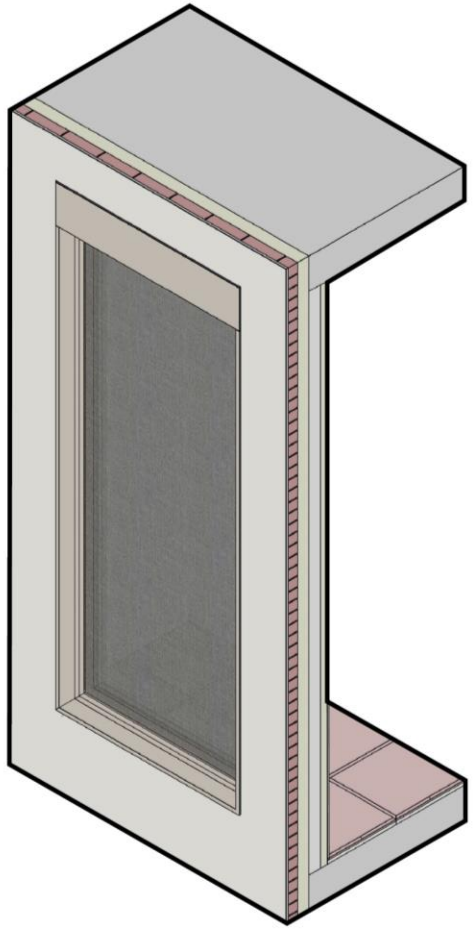


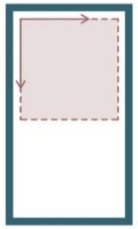


Views of residential building with roller shades (Source: Archdaily)

[01] Classification of shades

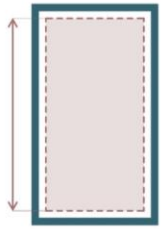
Roller shade parameters





Shade area

%



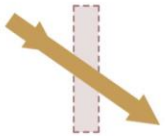
Shade state

Open / Close

Weave patterm

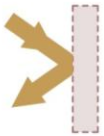
Openness factor

%



Transmittance

0 to 1



Reflectance

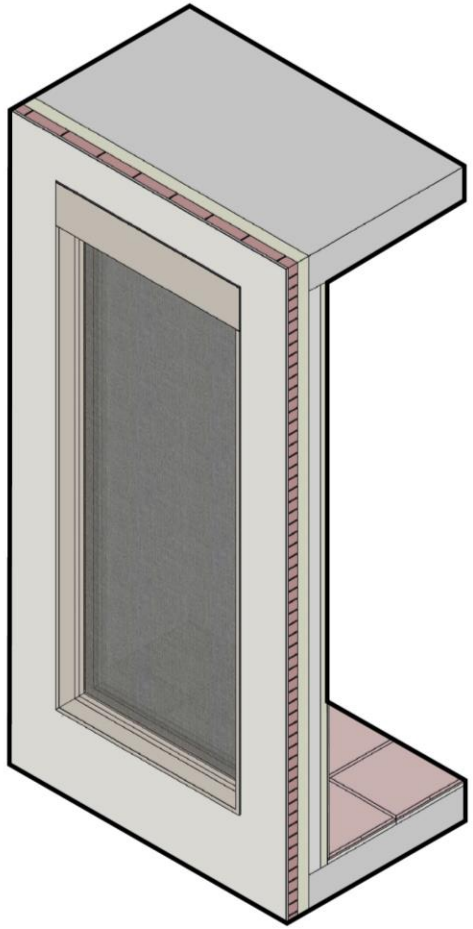
0 to 1

Absorptance

0 to 1

[01] Classification of shades

Roller shade parameters



Shade area

%

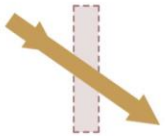
Shade state

Open / Close

Weave patterm

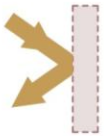
Openness factor

%



Transmittance

0 to 1



Reflectance

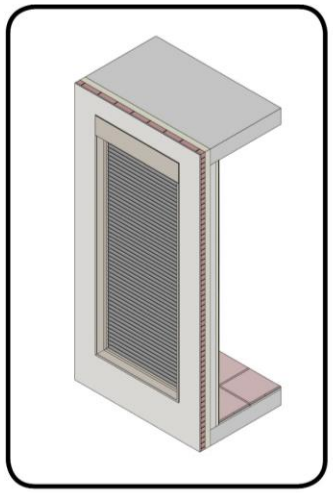
0 to 1

Absorptance

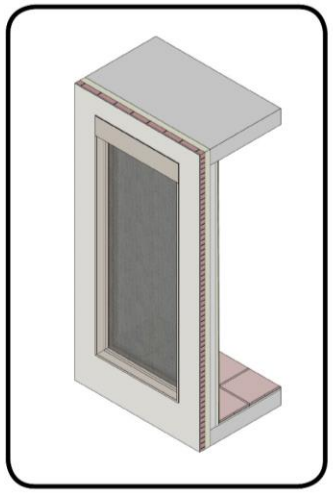
0 to 1

[01] Classification of shades

Shade combination design



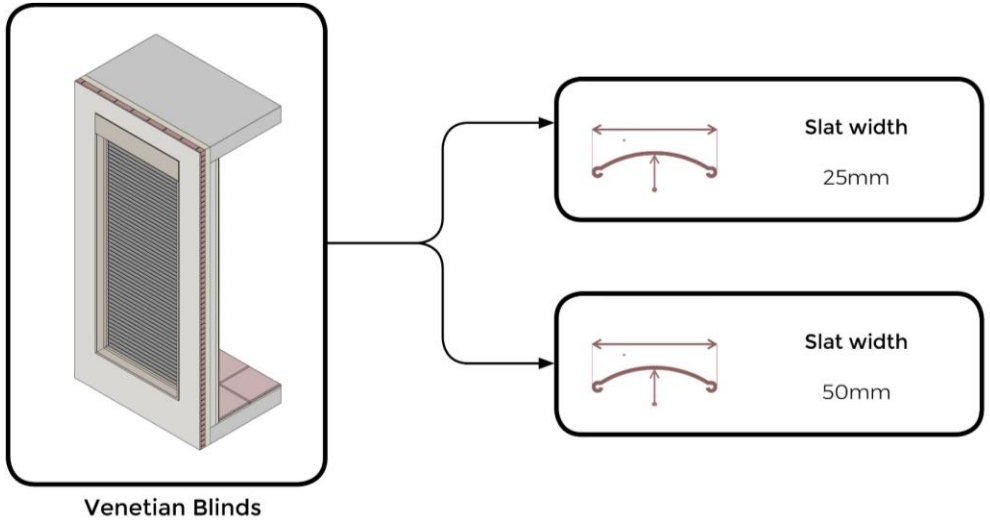
Venetian Blinds

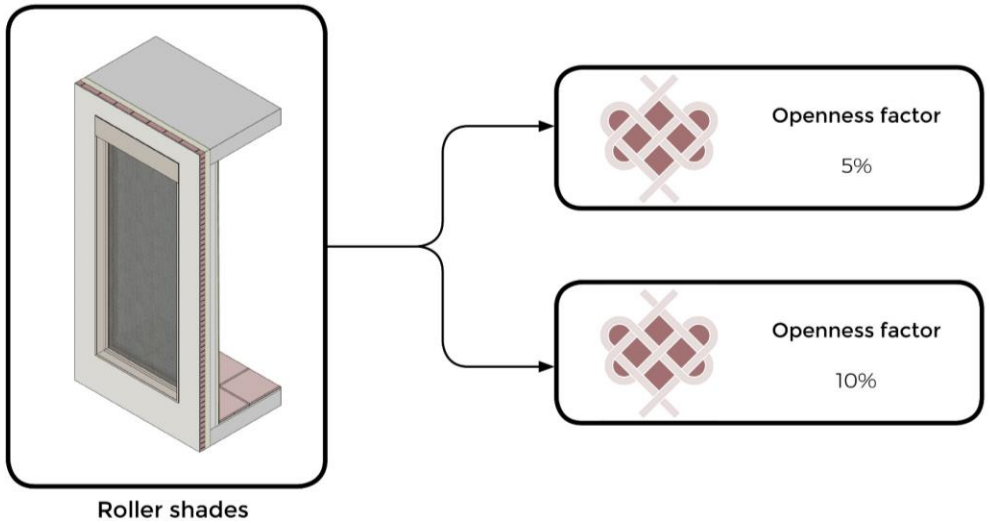


Roller shades

[01] Classification of shades

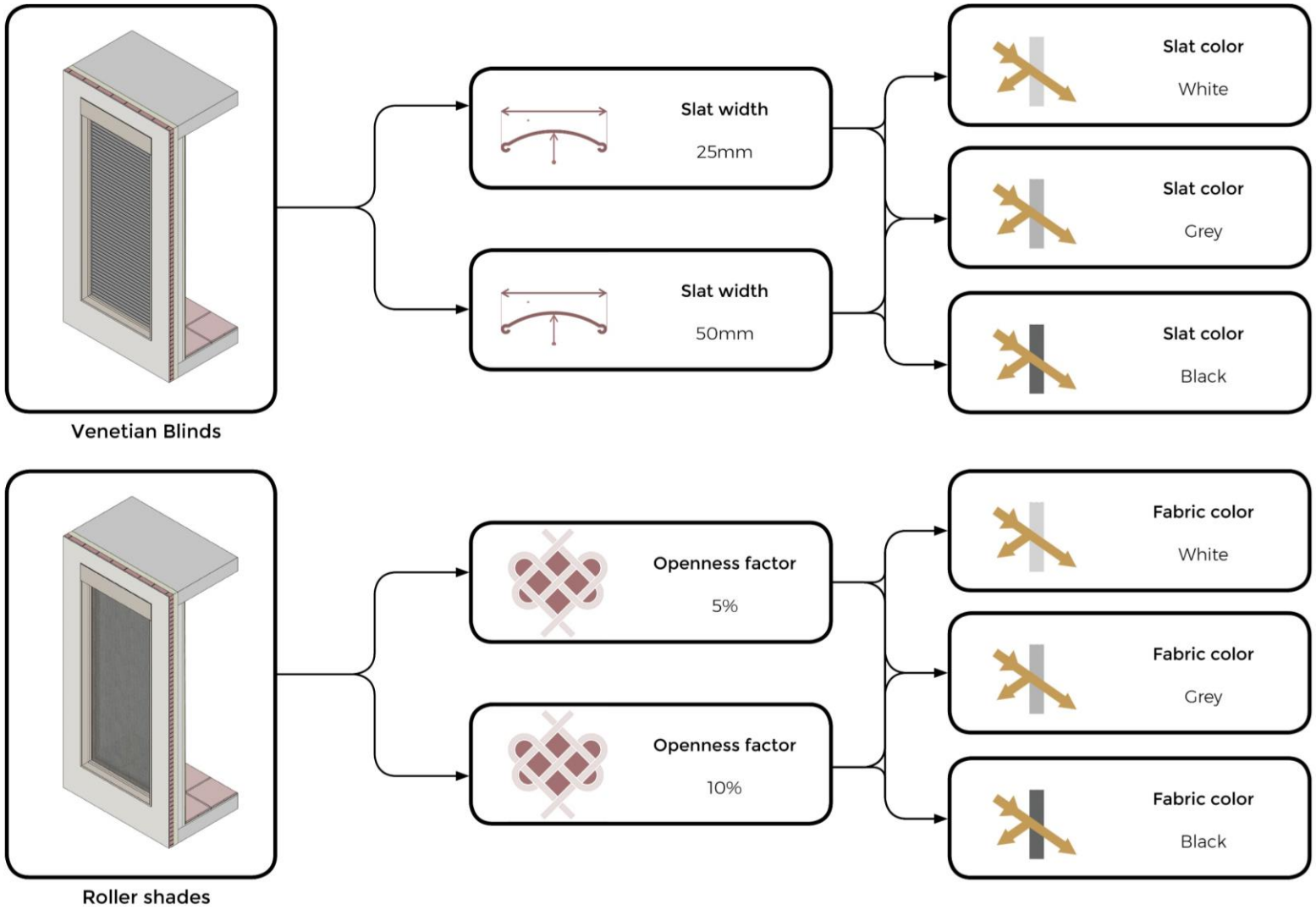
Shade combination design





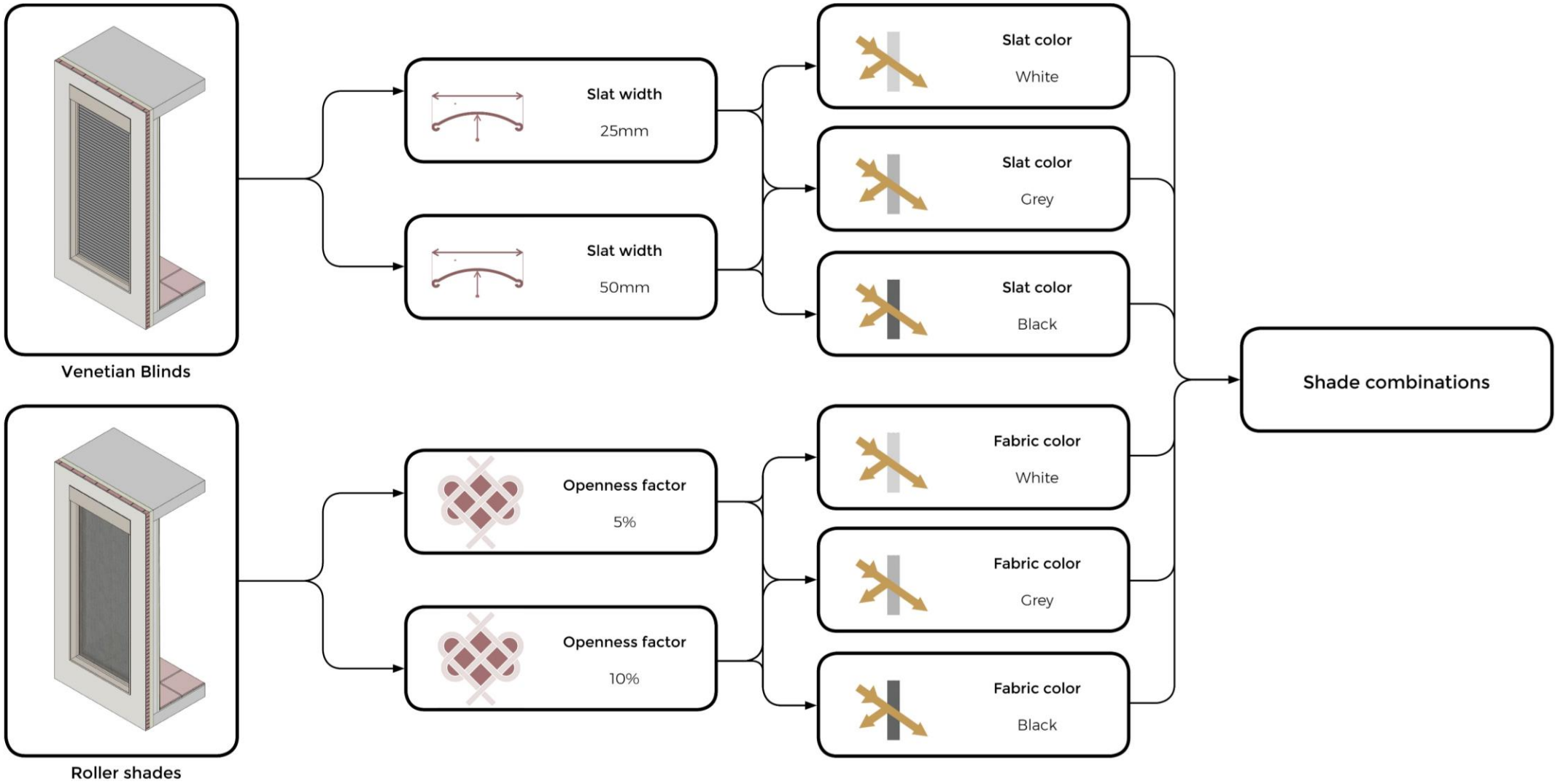
[01] Classification of shades

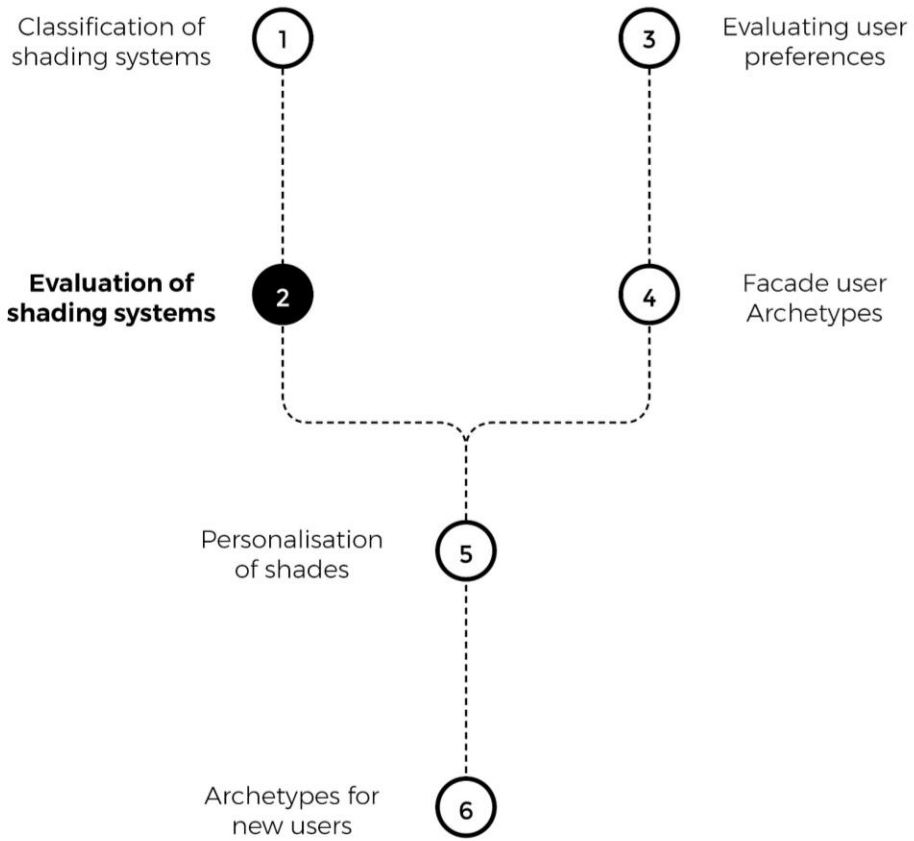
Shade combination design



[01] Classification of shades

Shade combination design




Classification of shading systems
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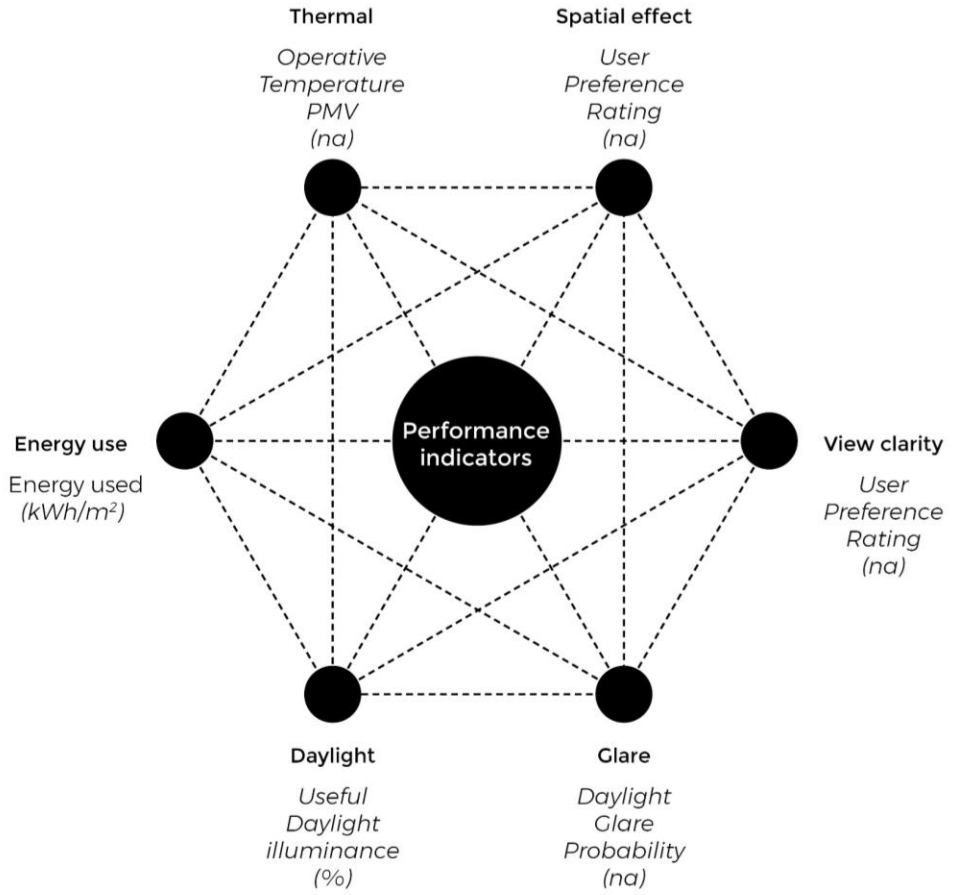
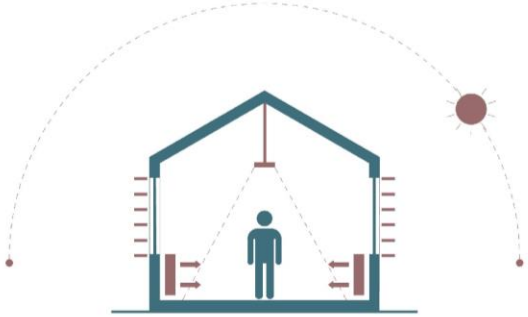
[02] Shade system evaluation

Key Performance Indicators



[02] Shade system evaluation

Key Performance Indicators

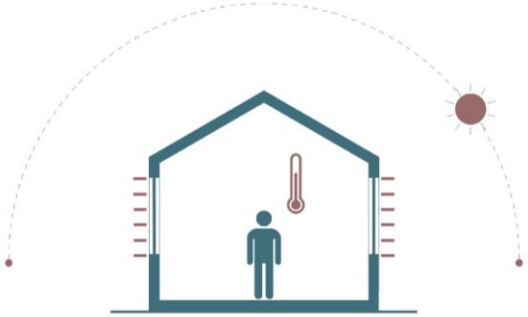


Energy Performance

Energy Use

The amount of energy used by the office space for heating, cooling and lighting exclusively during the occupied hours of the office.

range - na
unit - kWh/m^2

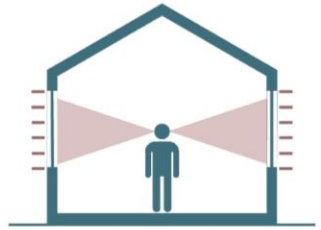


Thermal Comfort

PMV

Average sensation of thermal comfort perceived by a group of individuals in a given indoor environment.

range - -3 to +3
unit - na



Spatial effect

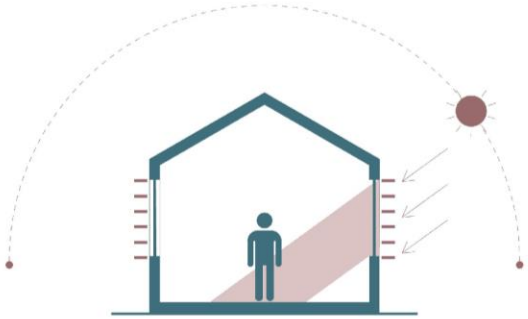
User Preference Rating

User rating for visual effect (light quality, light uniformity, shadows) of interior space when shading system is deployed.

range - 0 to 1
unit - na

[02] Shade system evaluation

Key Performance Indicators

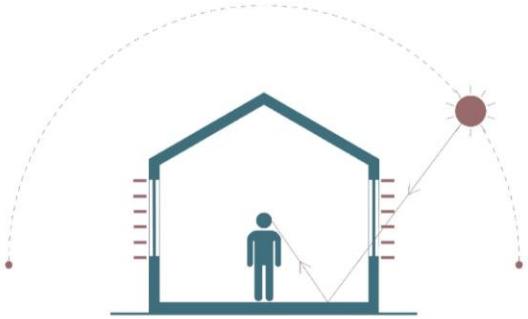


Daylight

Useful Daylight Illuminance

The ratio of time when the lighting levels at the workplace are fluctuating between the two 300 lux and 3000 lux is known as the UDI.

range - 0 to 100
unit - na (%)

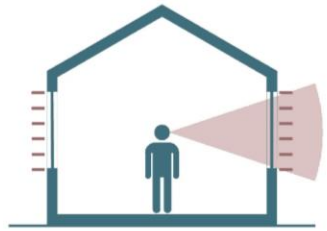


Glare

Daylight Glare Probability

DGP is expressed as a percentage and represents the probability that an occupant will experience discomfort due to glare from daylight.

range - 0 to 1
unit - na



View Clarity

User Preference Rating

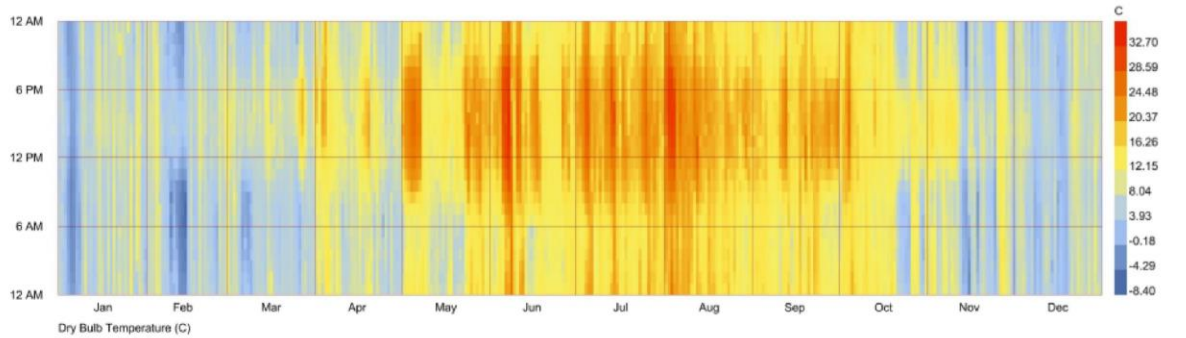
View clarity is a metric assessing how clearly the visual content in the view can be seen by the occupant when considering the visual obstructions present at the window.

range - 0 to 1
unit - na

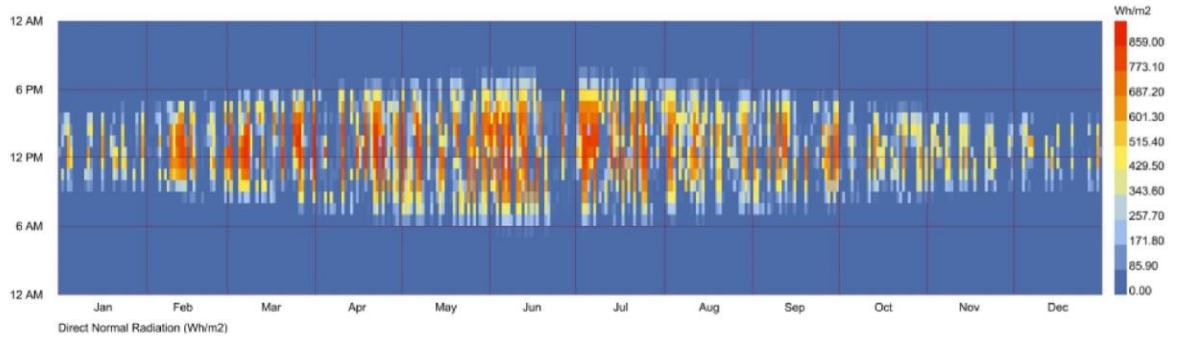
[02] Shade system evaluation

Weather

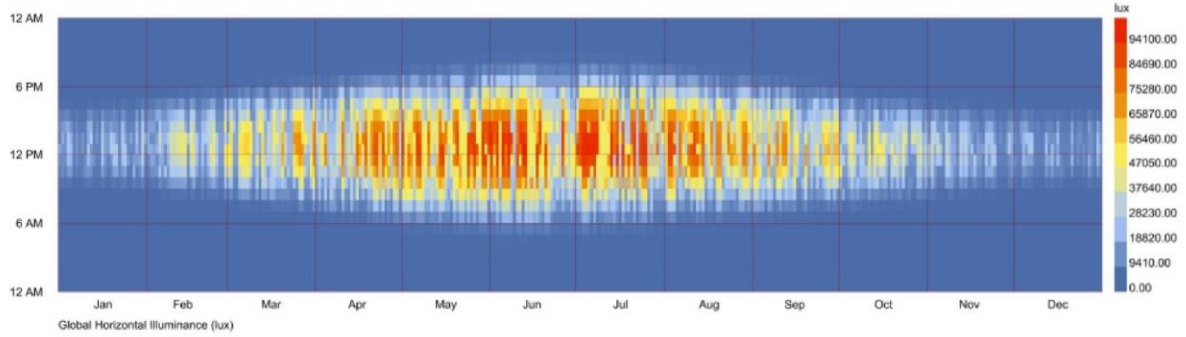
Dry Bulb Temperature



Direct Normal Radiation

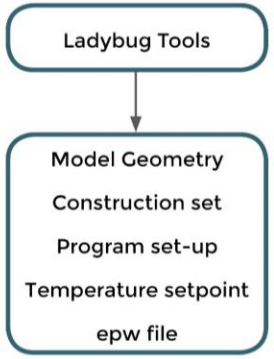


Global Horizontal Illuminance



[02] Shade system evaluation

Simulation workflow



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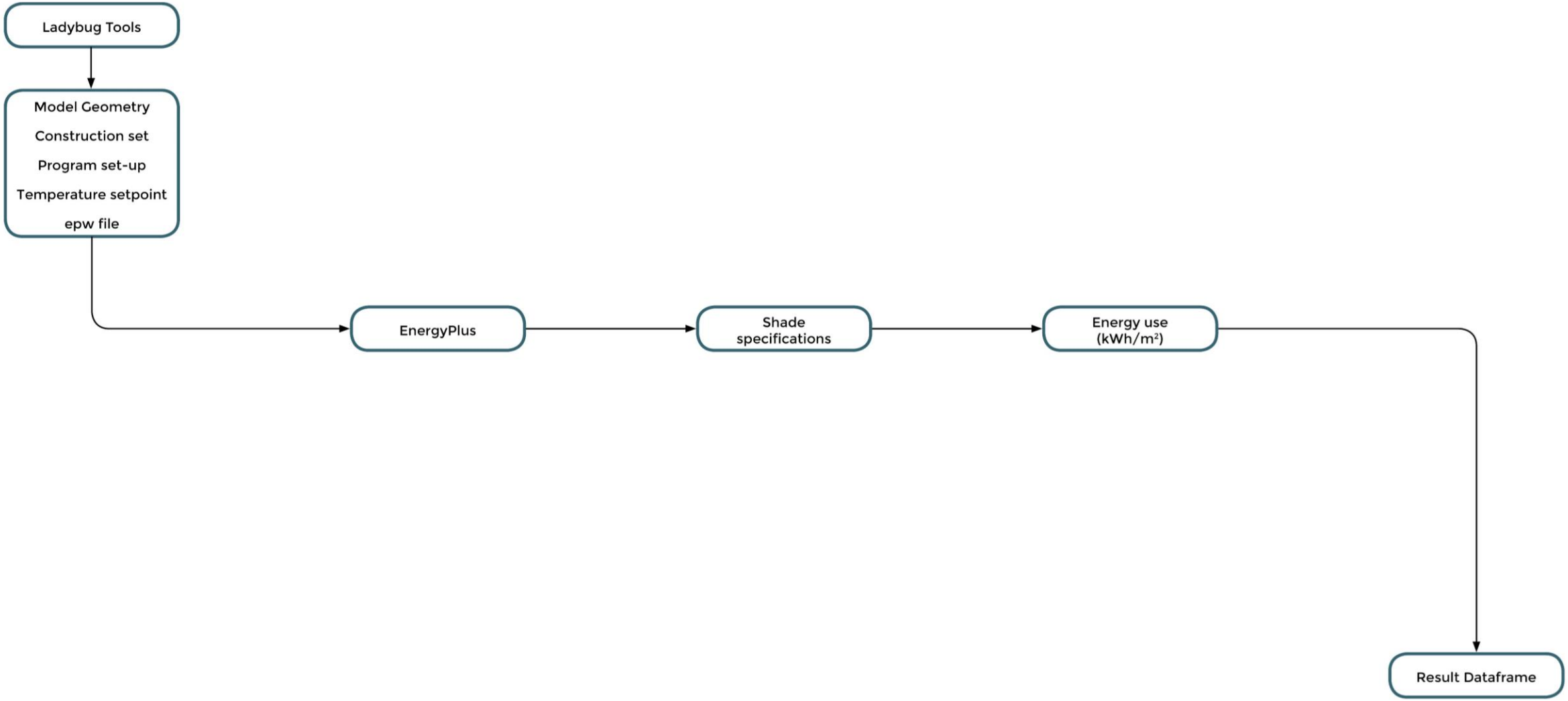

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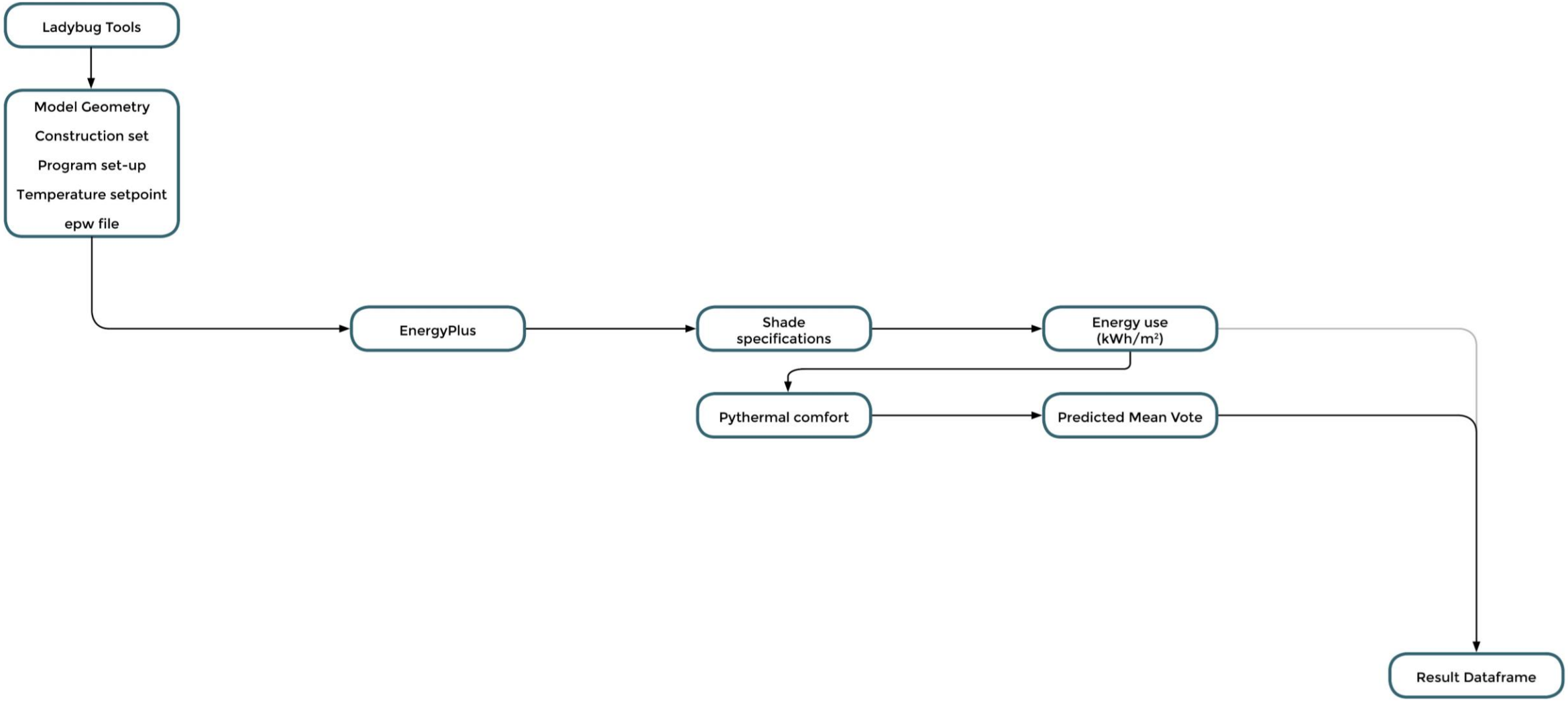

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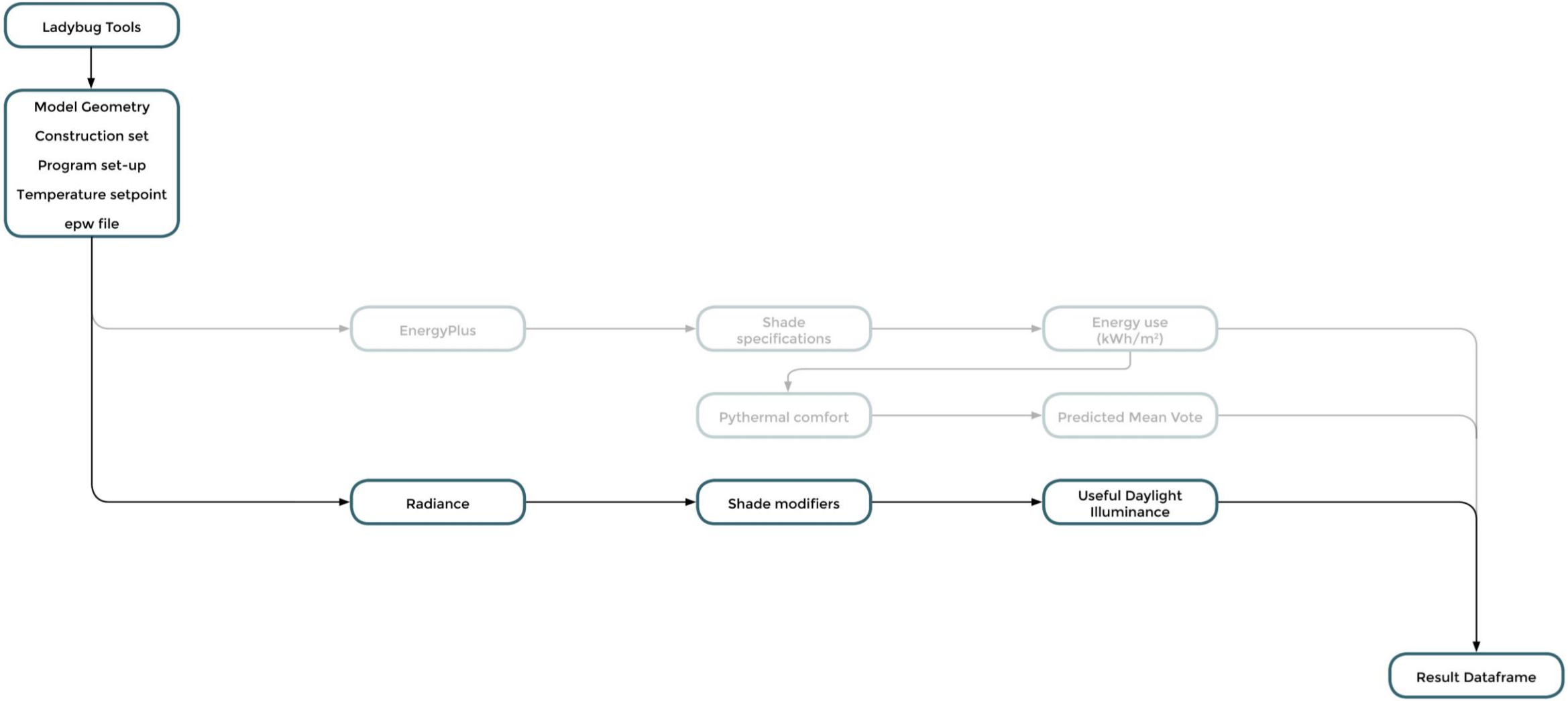

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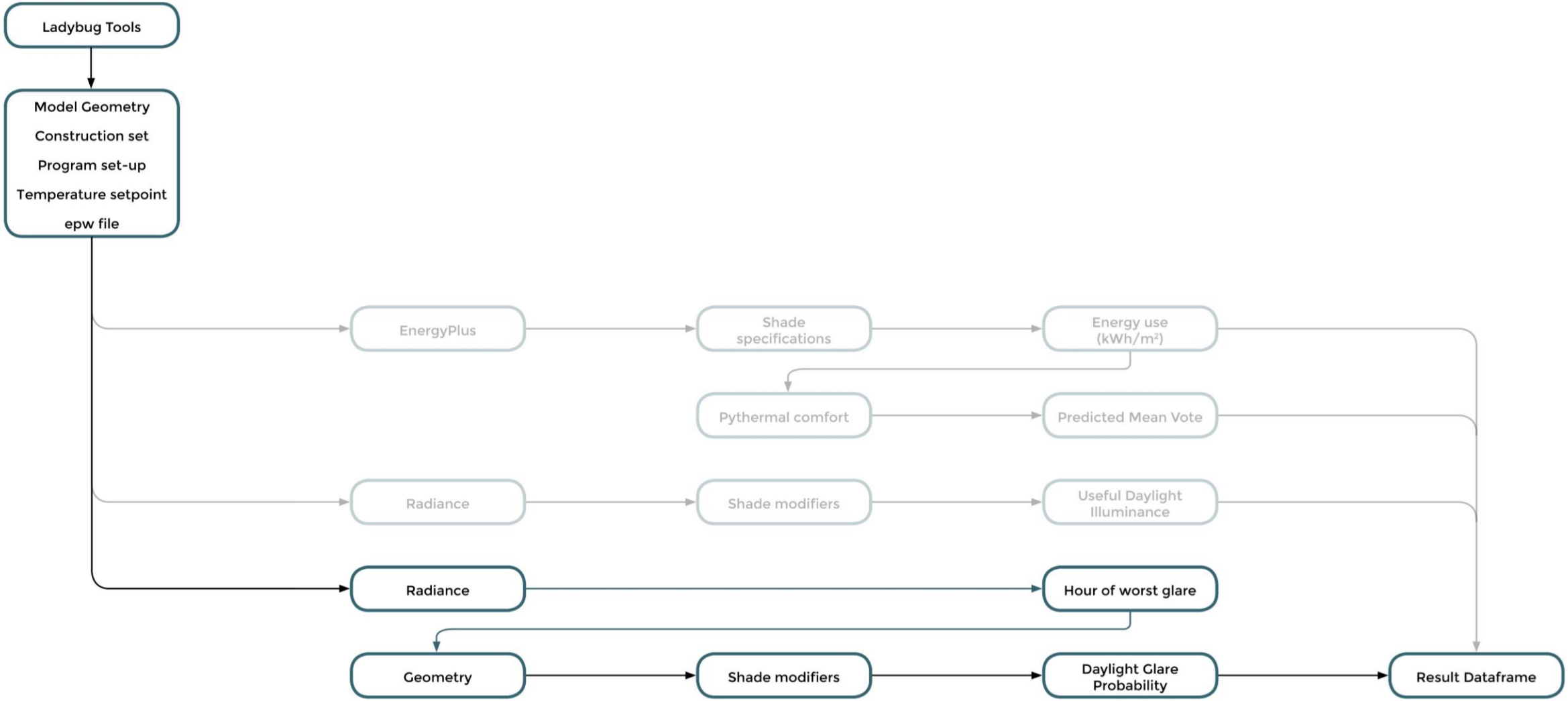
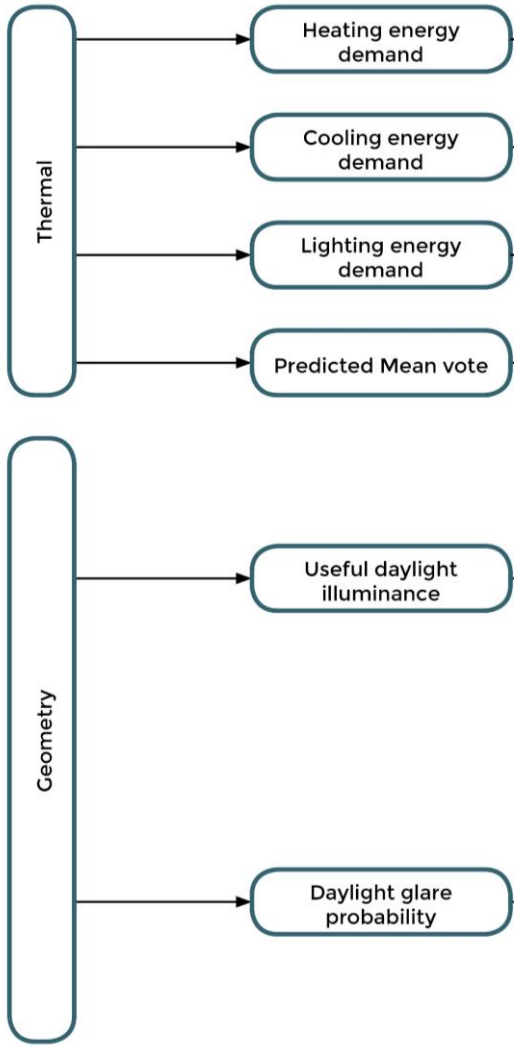


[02] Shade system evaluation

Normalisation of KPI's



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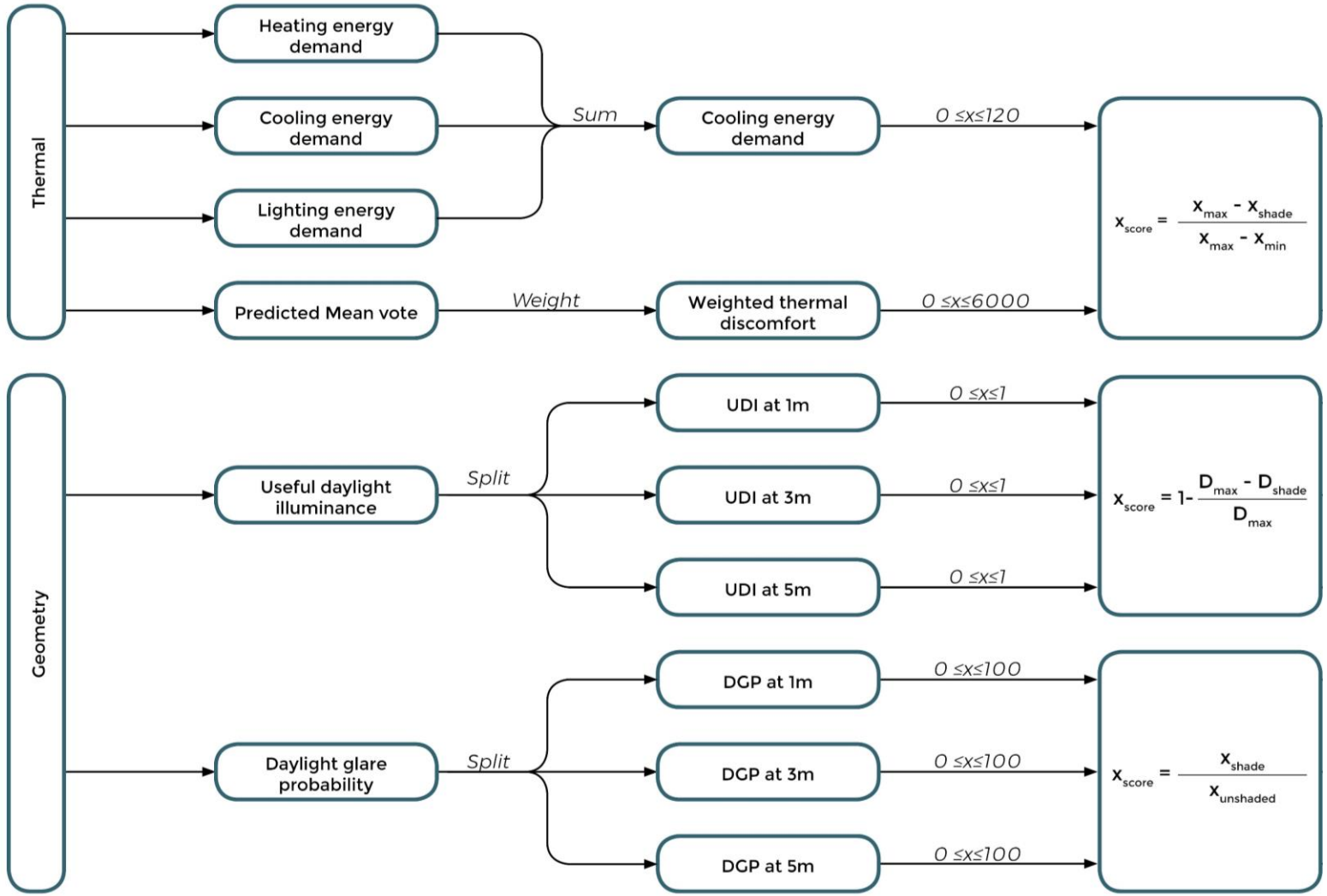

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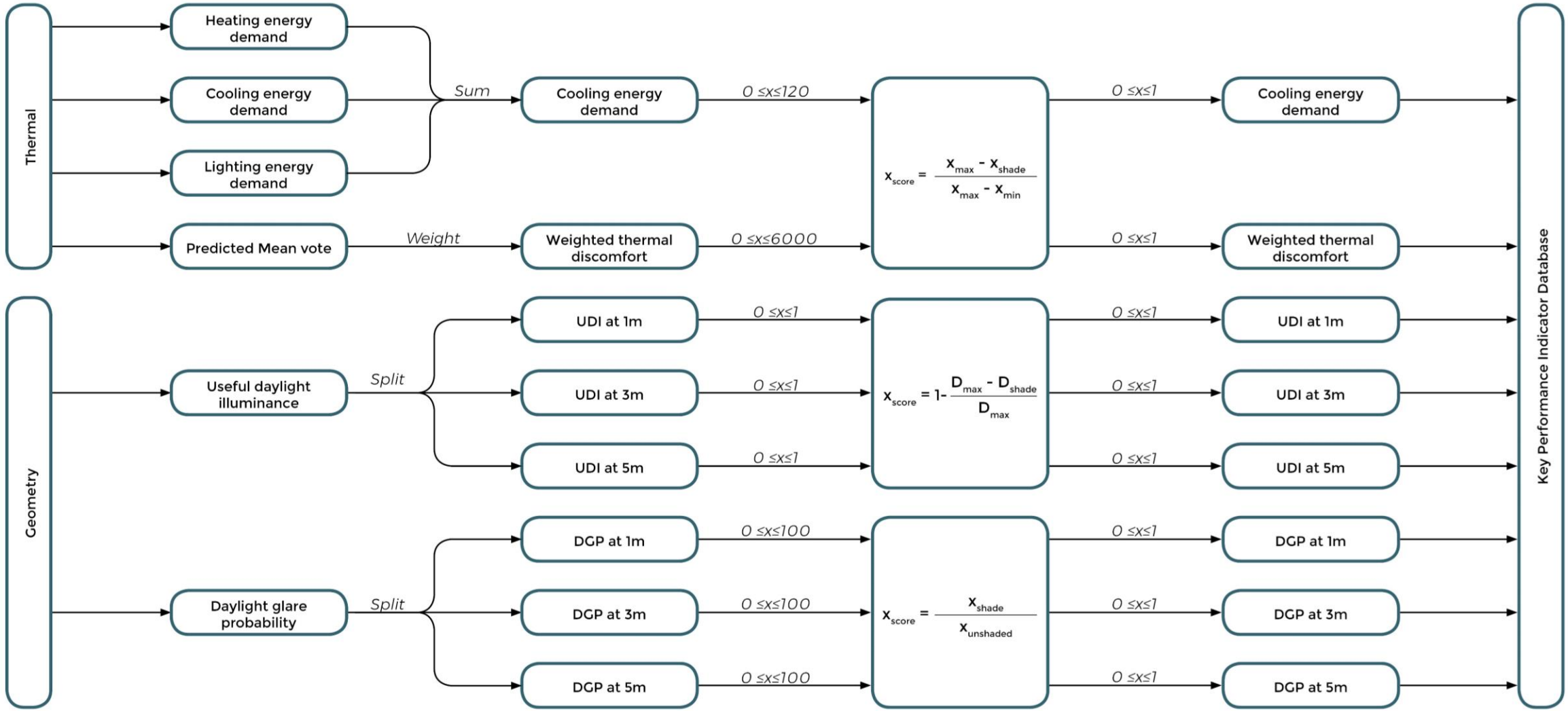
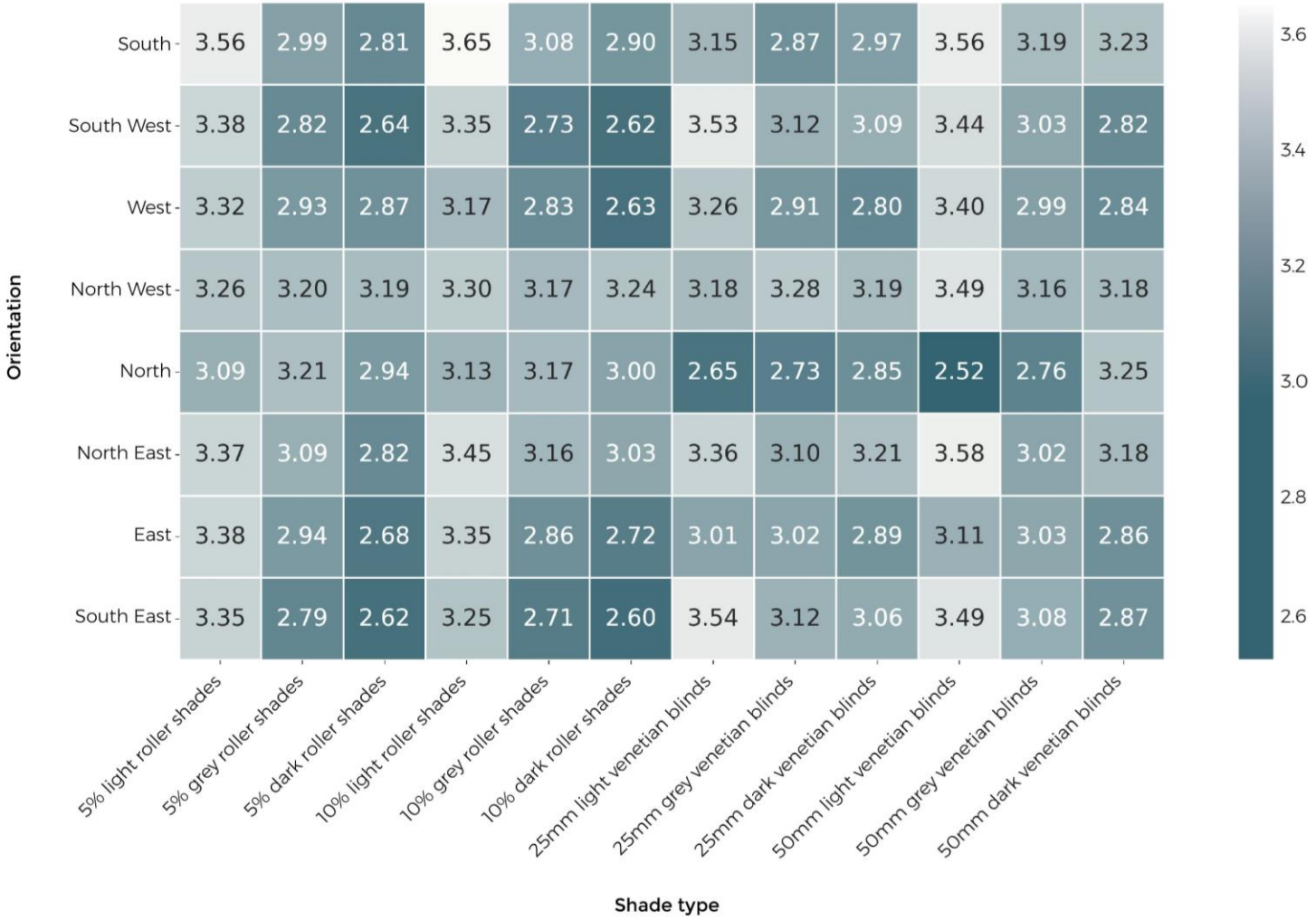


[02] Shade system evaluation

Shade score heatmap



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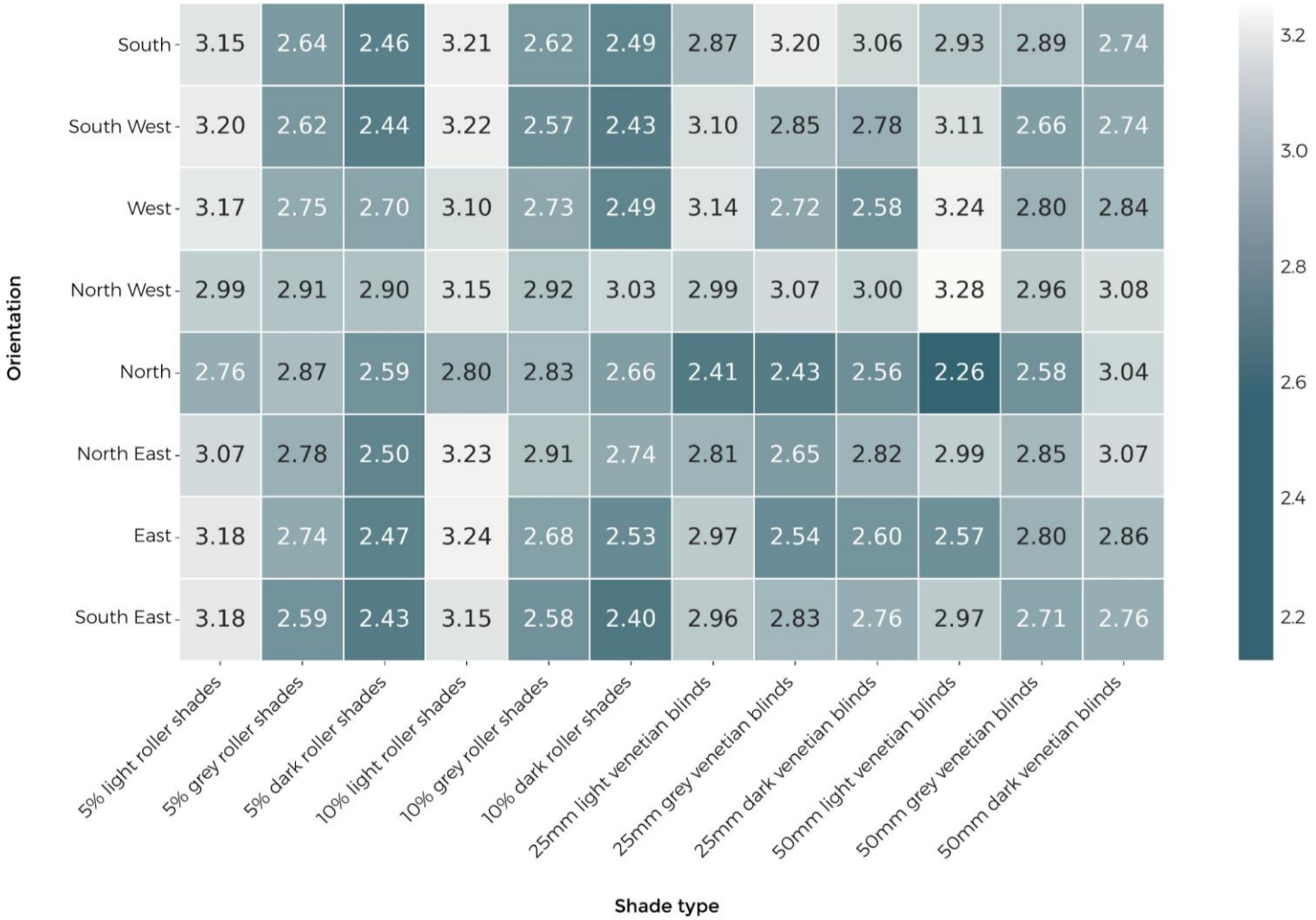

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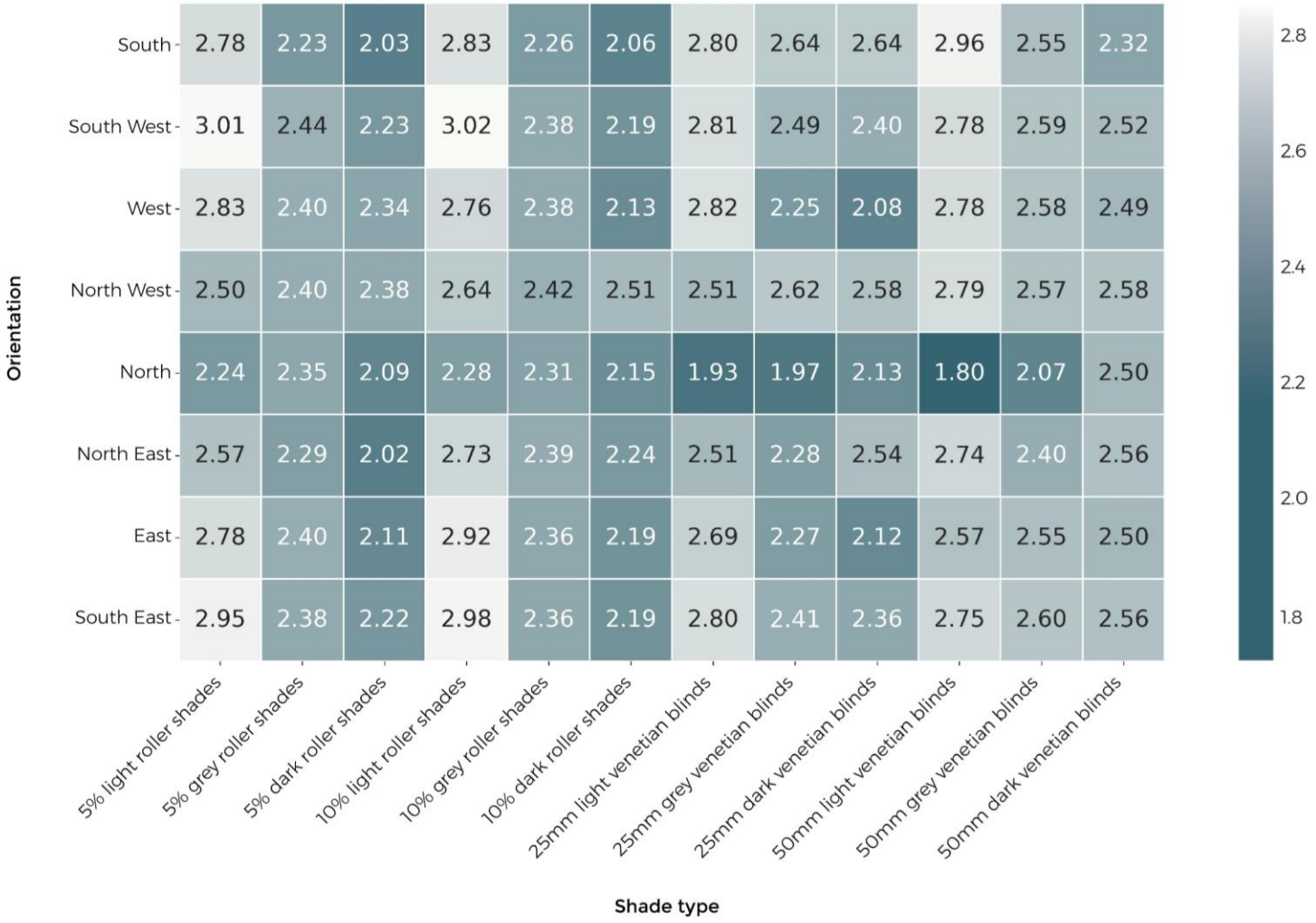
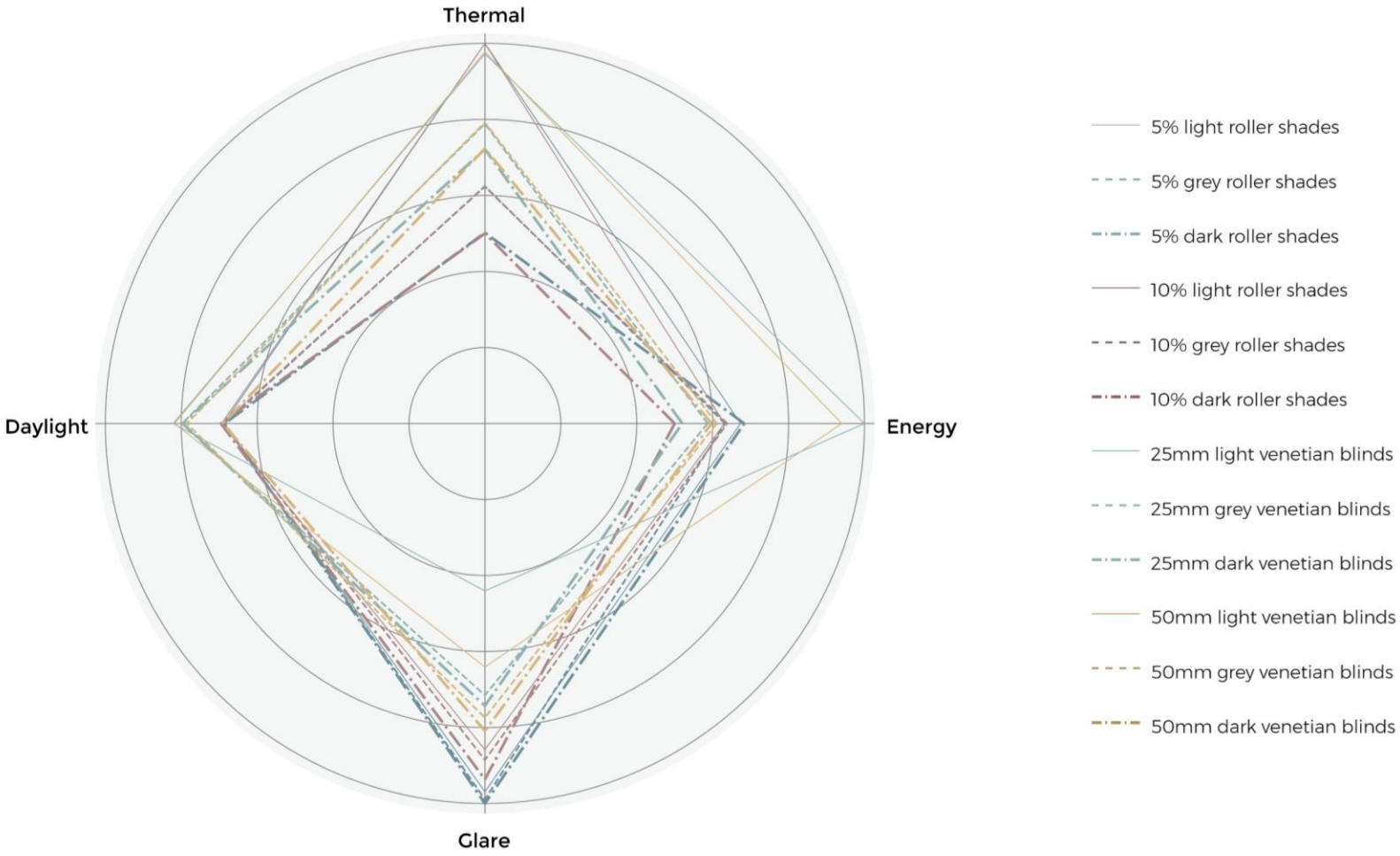
Shade score heatmap



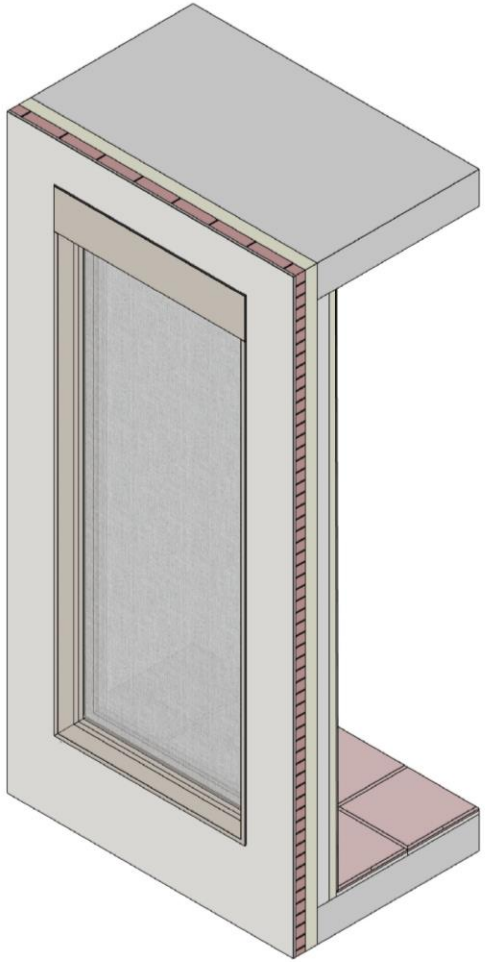
[02] Shade system evaluation

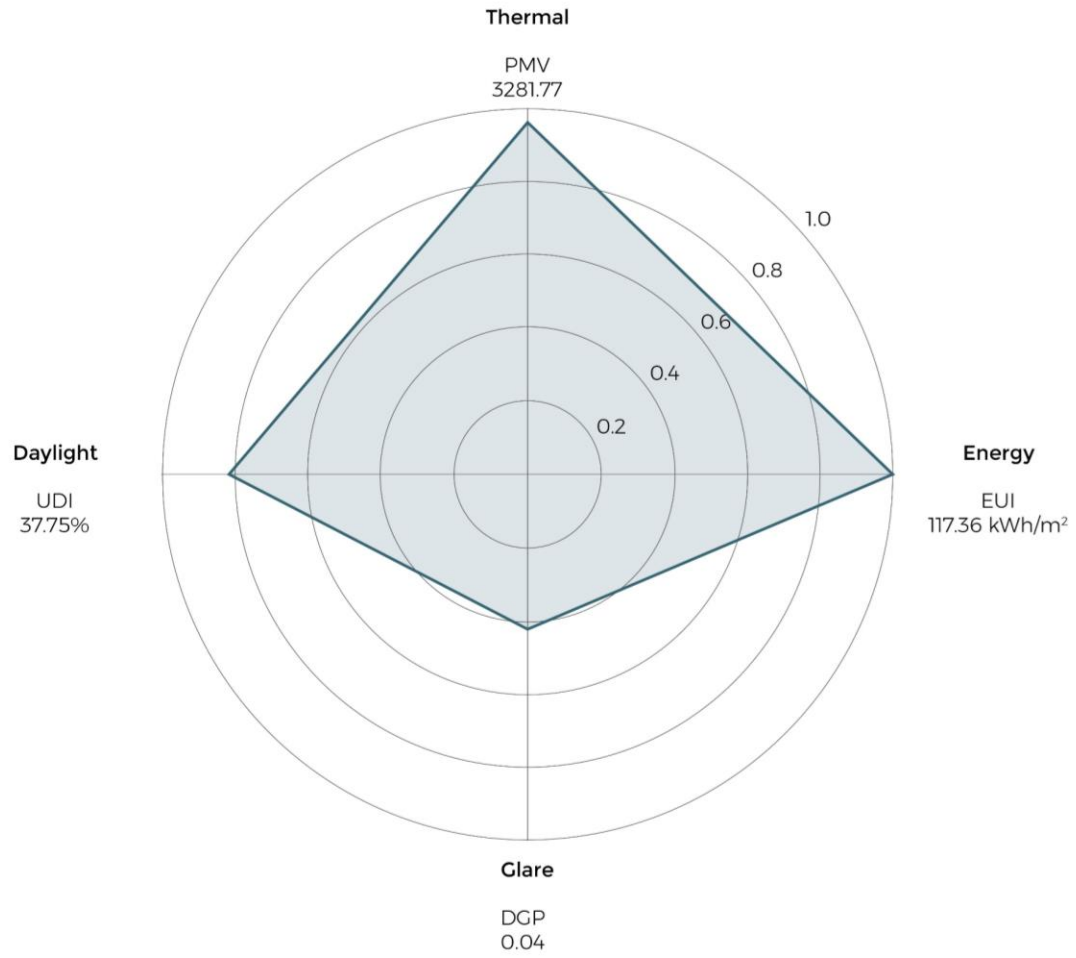
Shade score radial-plot



[02] Shade system evaluation

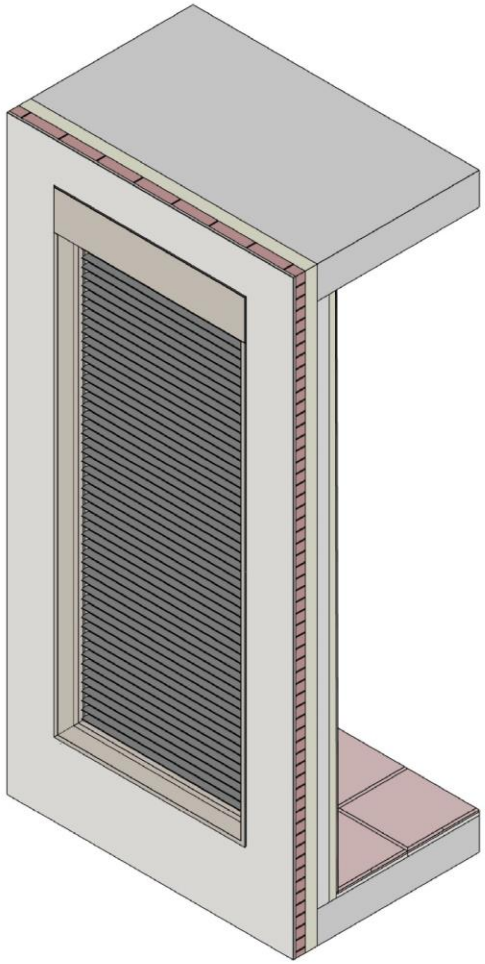
5% Light Roller shade score radial-plot

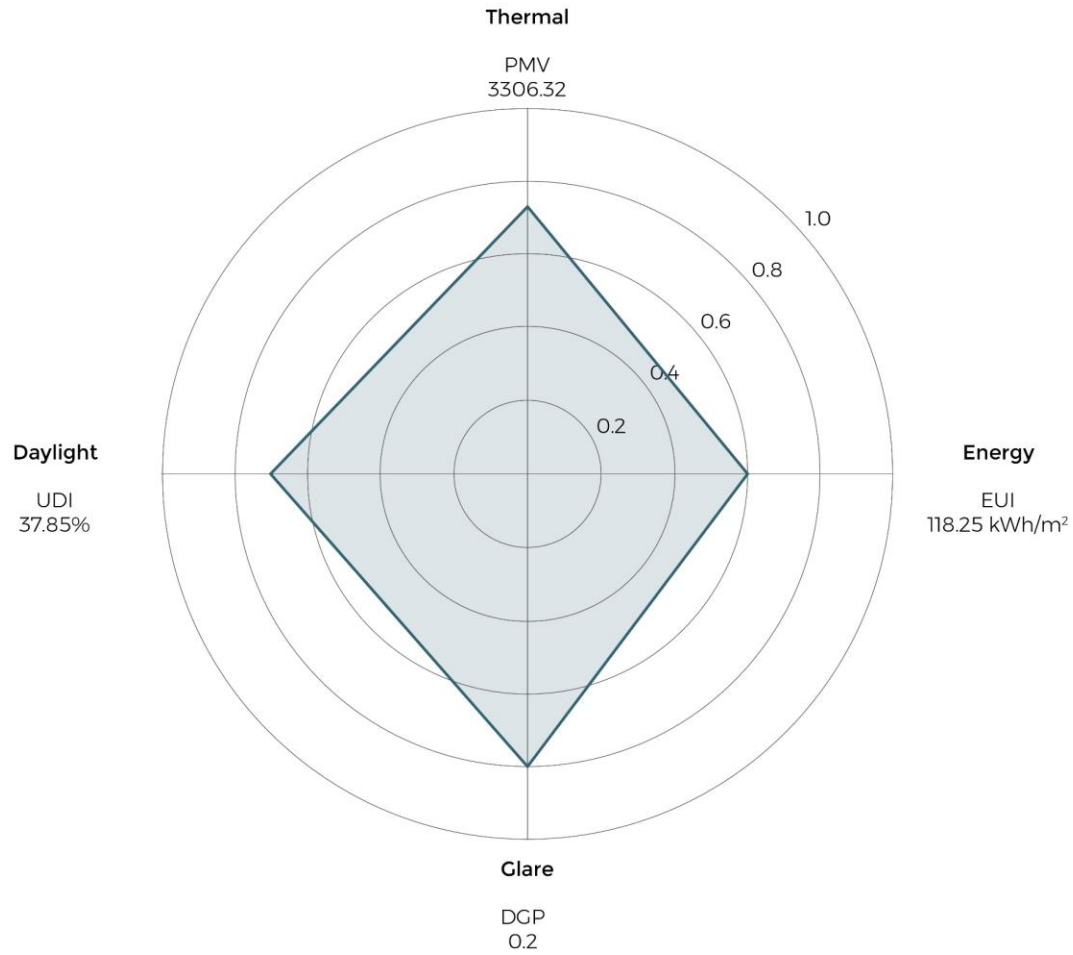


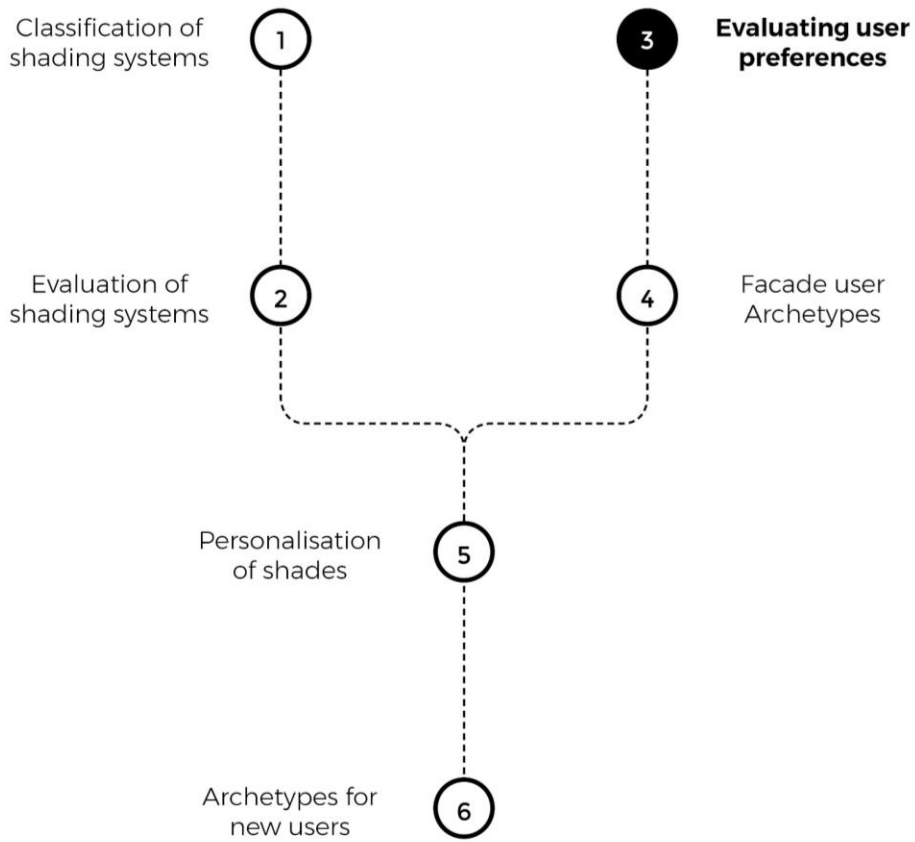


[02] Shade system evaluation

50mm dark venetian blinds score radial-plot



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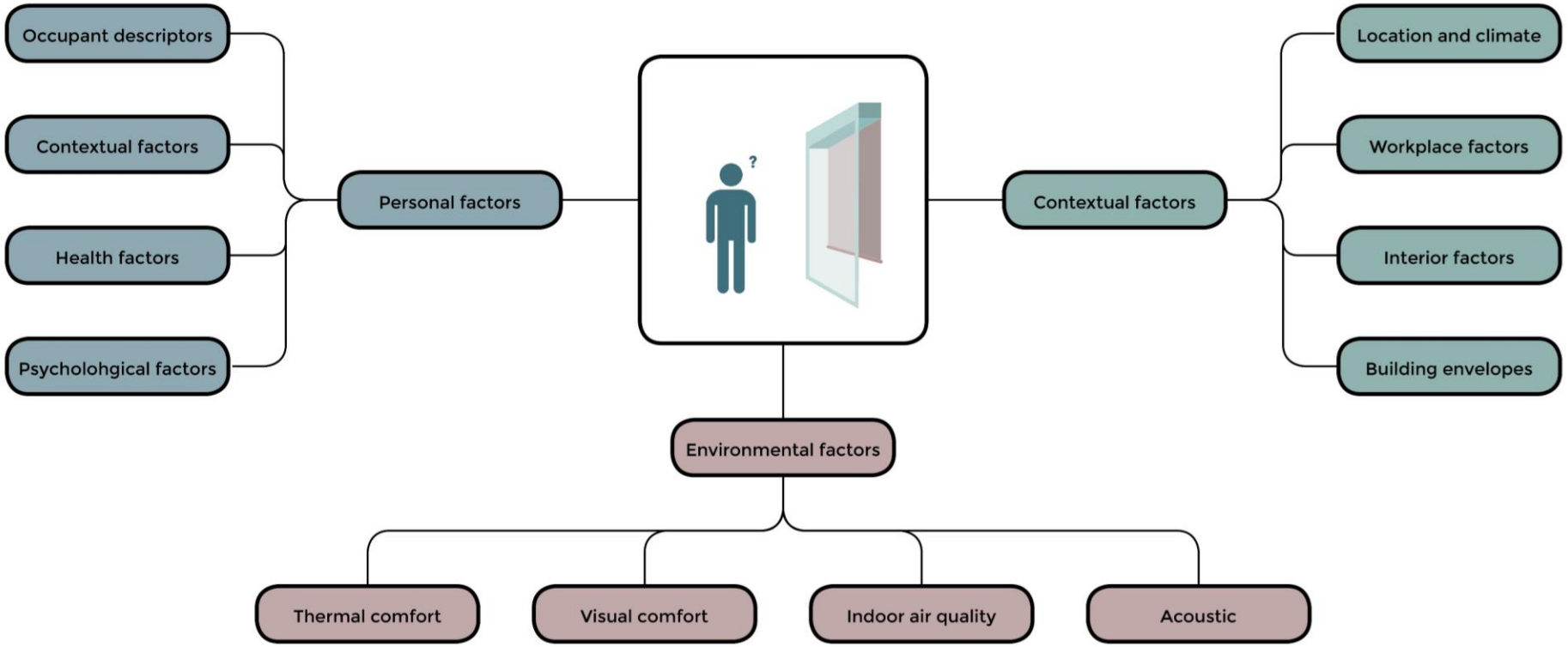
[03] Factors affecting user preferences

Literature Review

Explore the application of clustering techniques in analyzing user preferences and their influence on indoor environmental quality (IEQ) and comfort in the context of facade design.

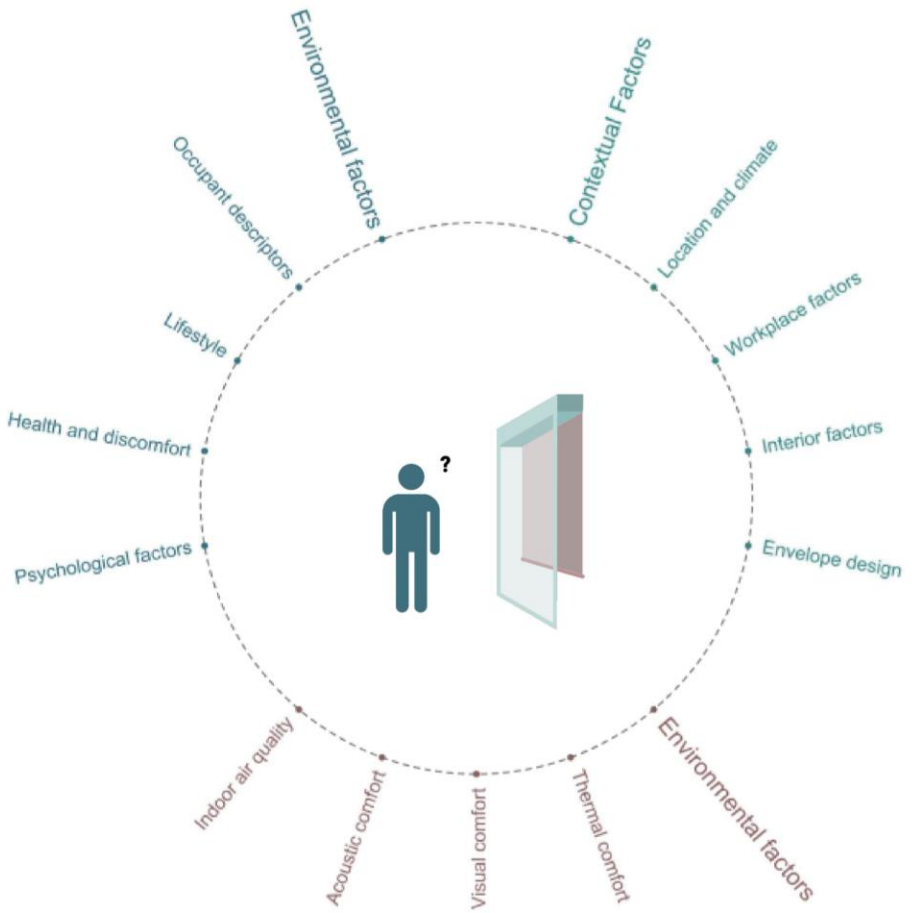
[03] Factors affecting user preferences

Literature Review



[03] Factors affecting user preferences

Literature Review



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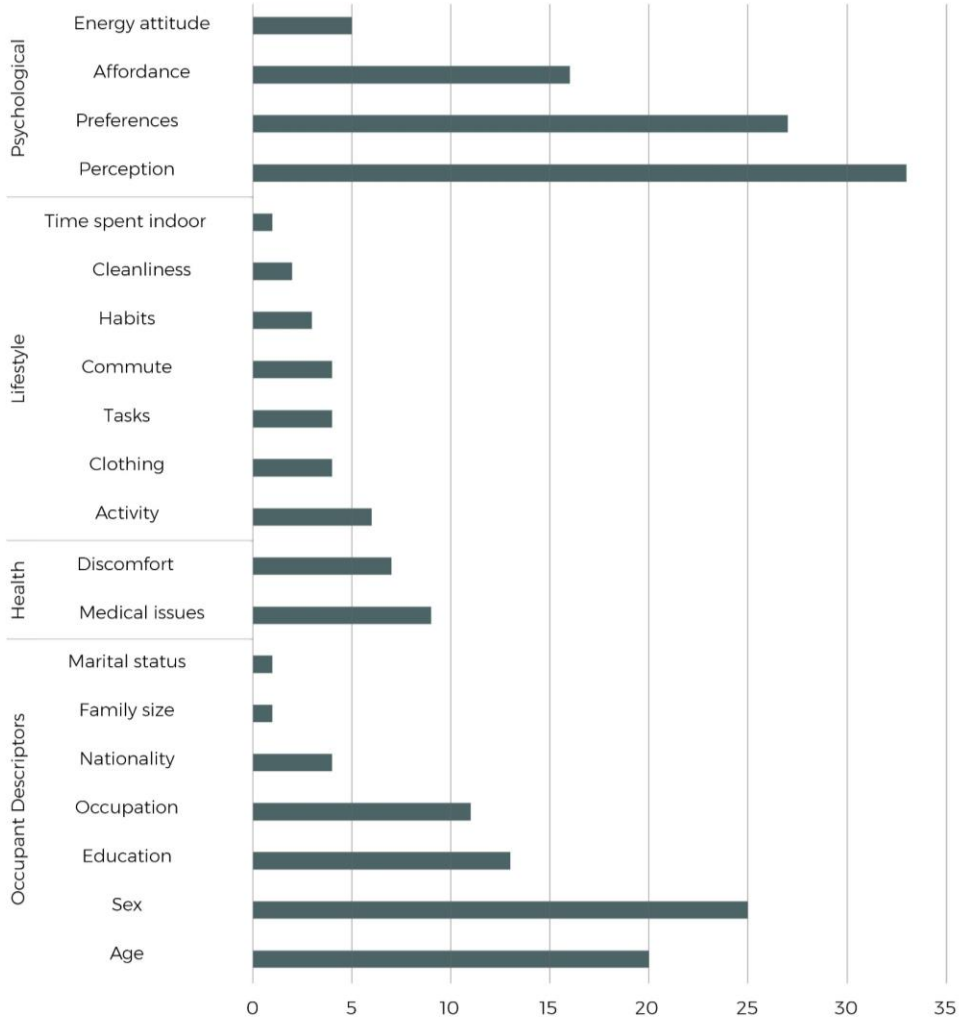

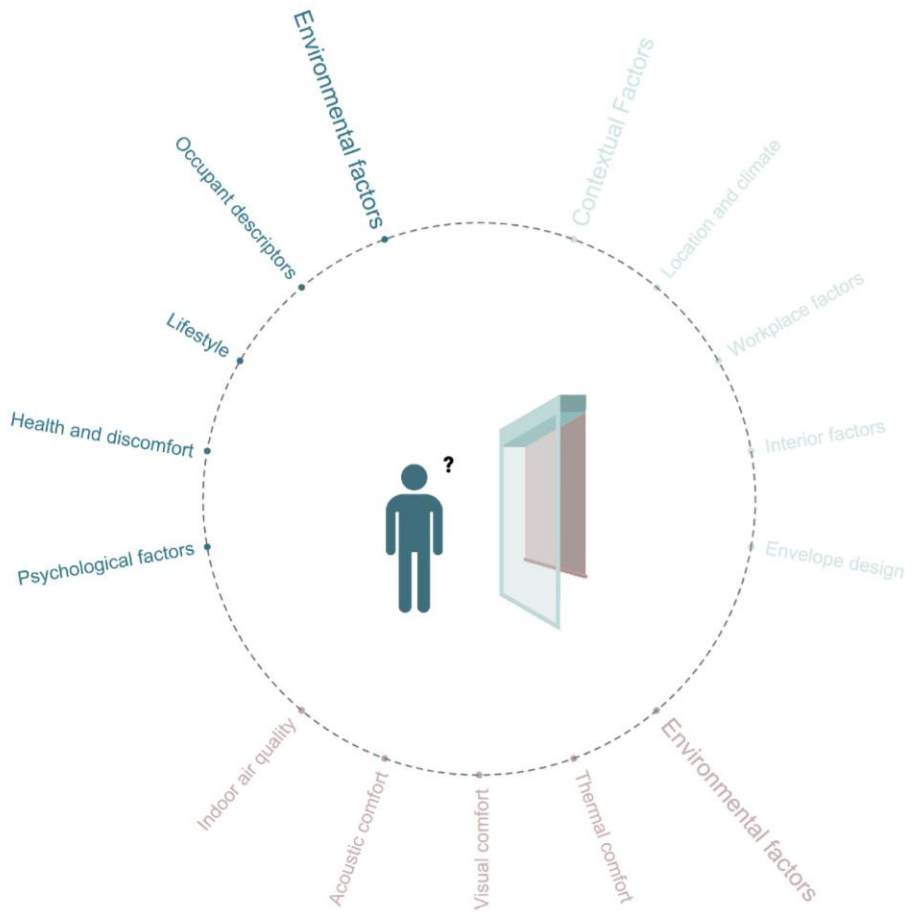

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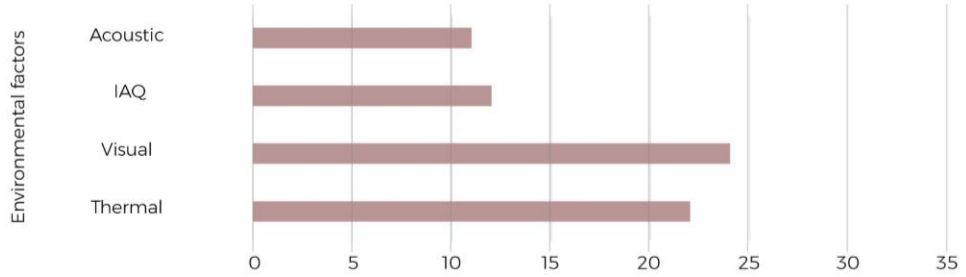

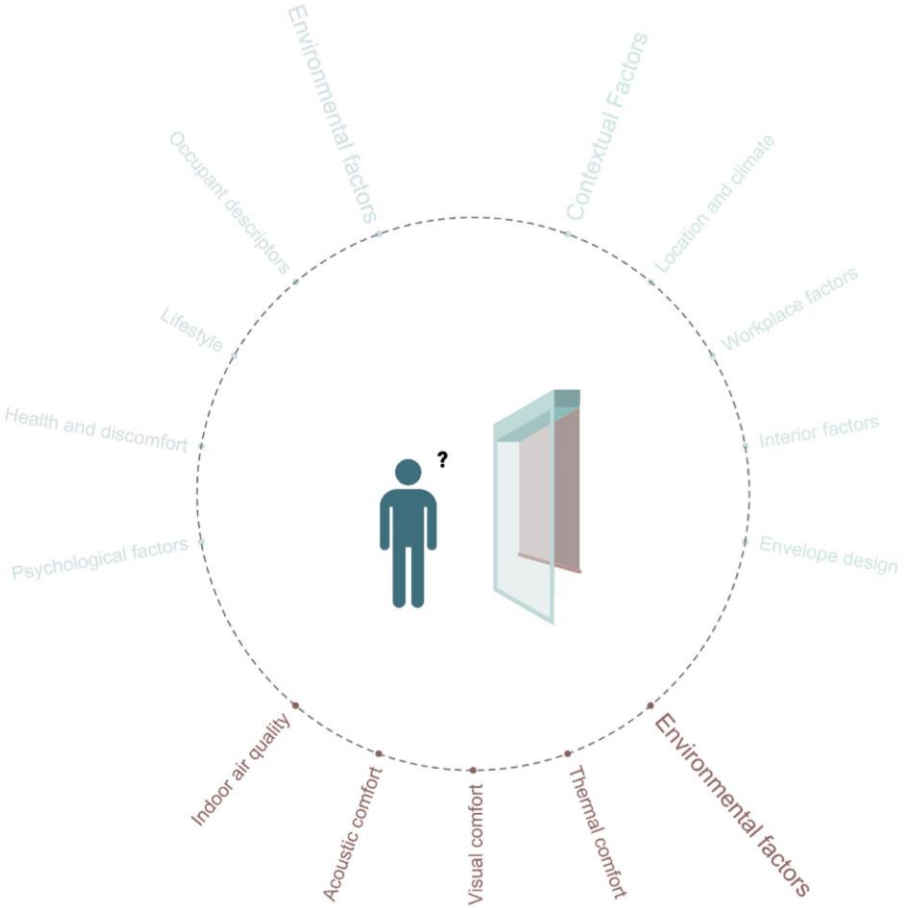

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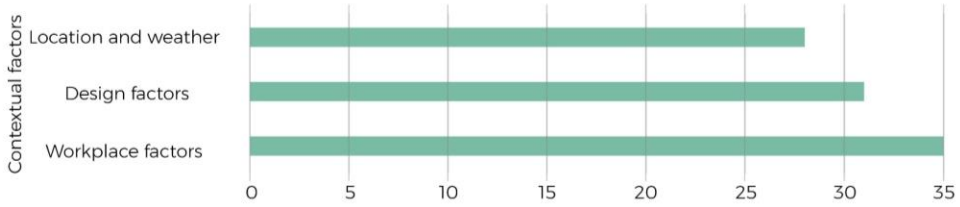
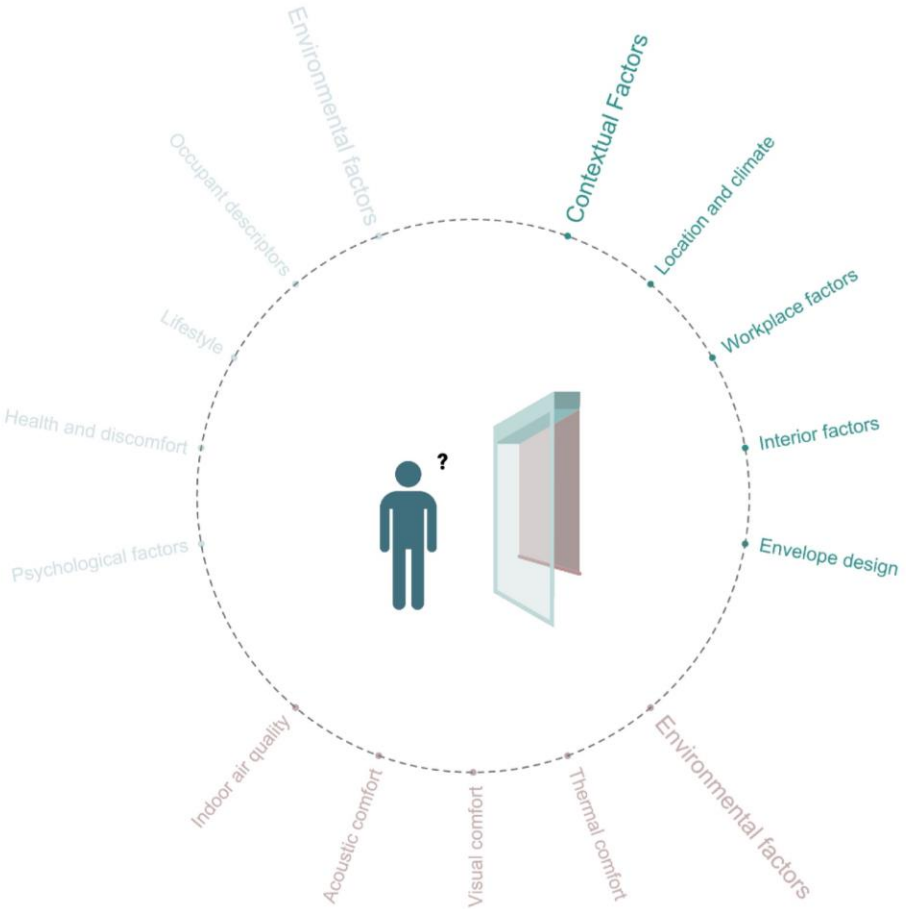
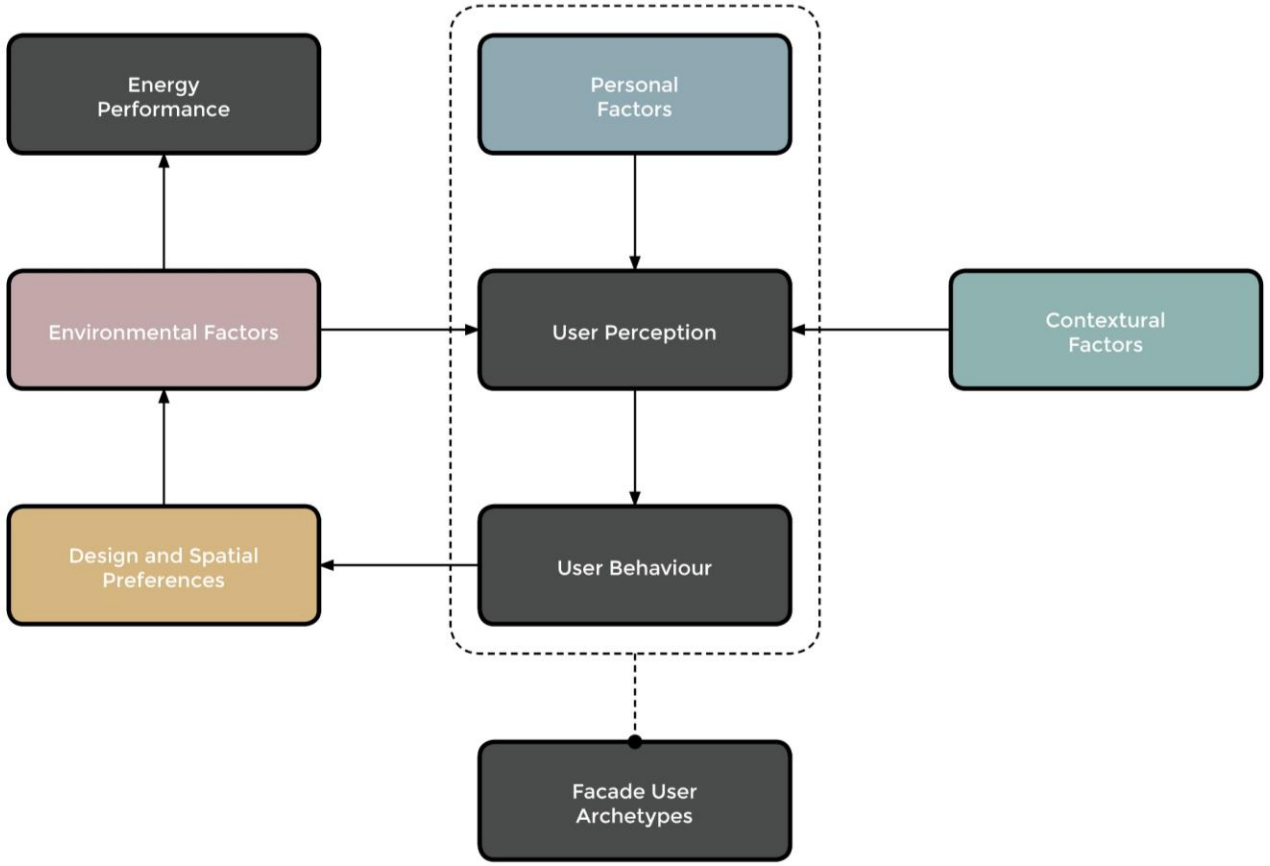




[03] Factors affecting user preferences

Survey Design



[03] Factors affecting user preferences

Survey Design

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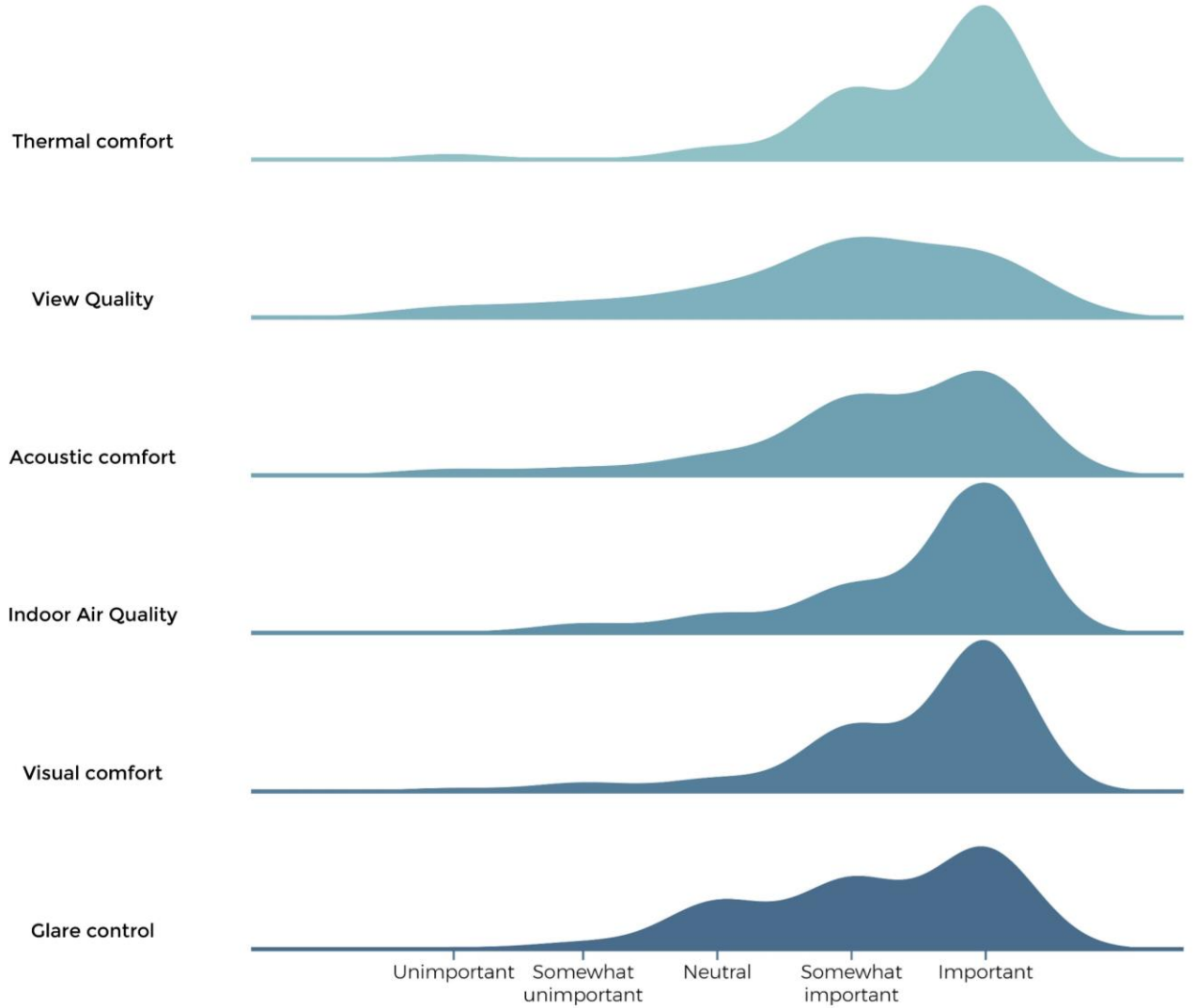
Survey Responses



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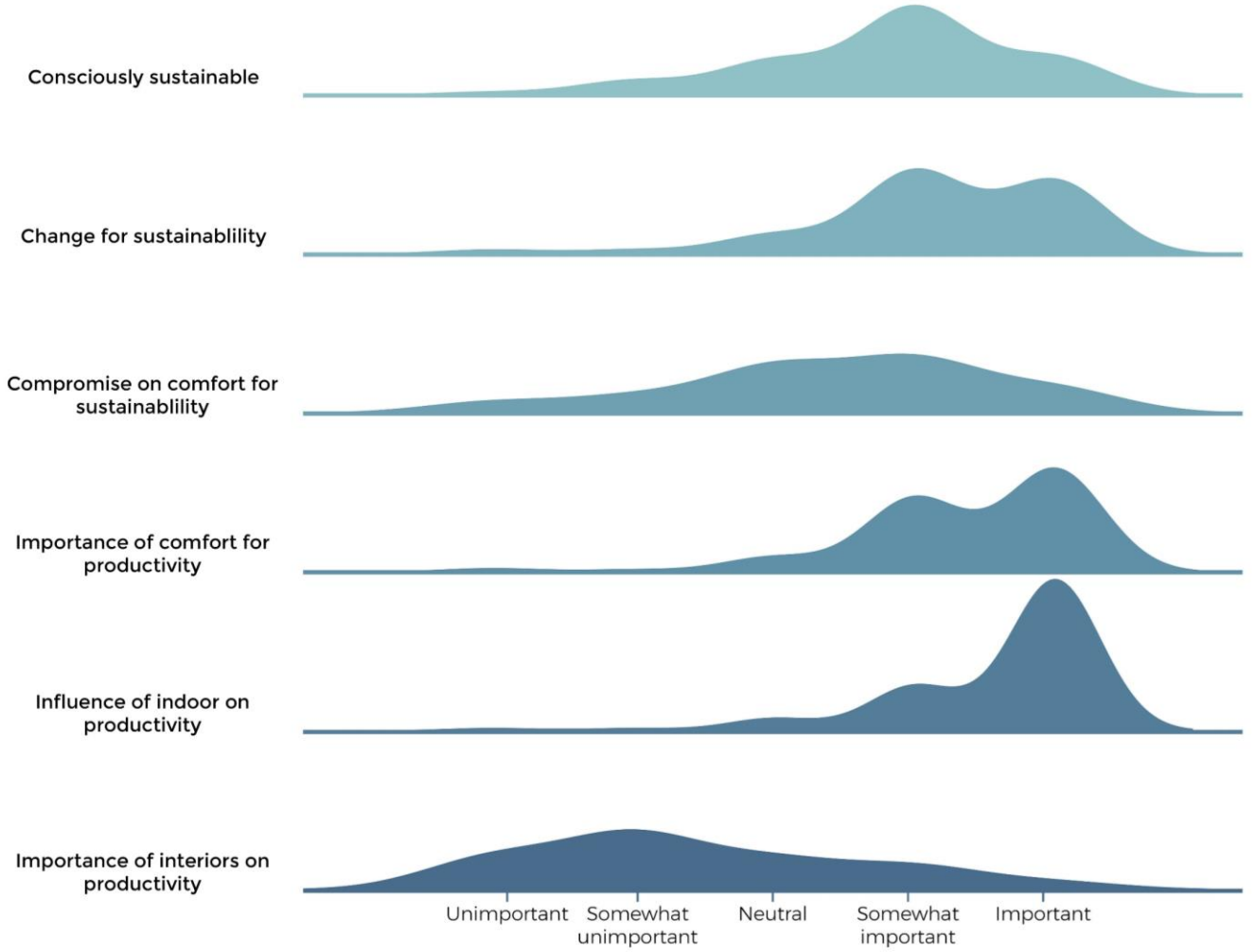
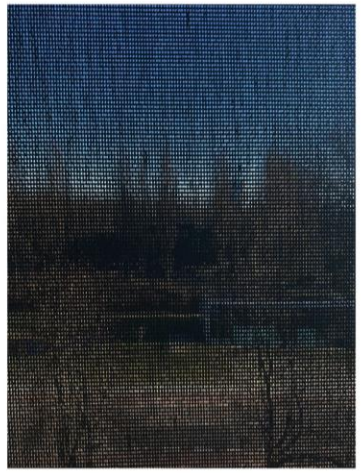
Survey Responses



[03] Factors affecting user preferences

Survey Responses

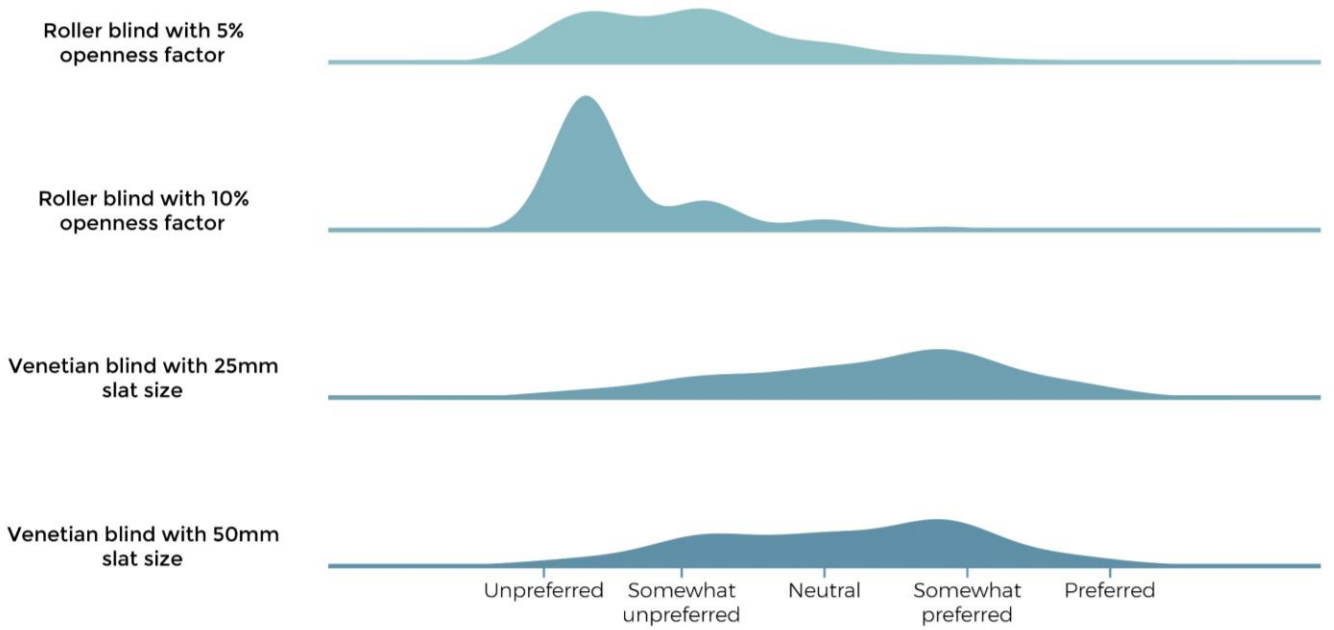
Roller blind with 5% openness factor



Roller blind with 10% openness factor

Venetian blind with 25mm slat size

Venetian blind with 50mm slat size



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Survey Responses

Roller blind with 5% openness factor

Roller blind with 10% openness factor

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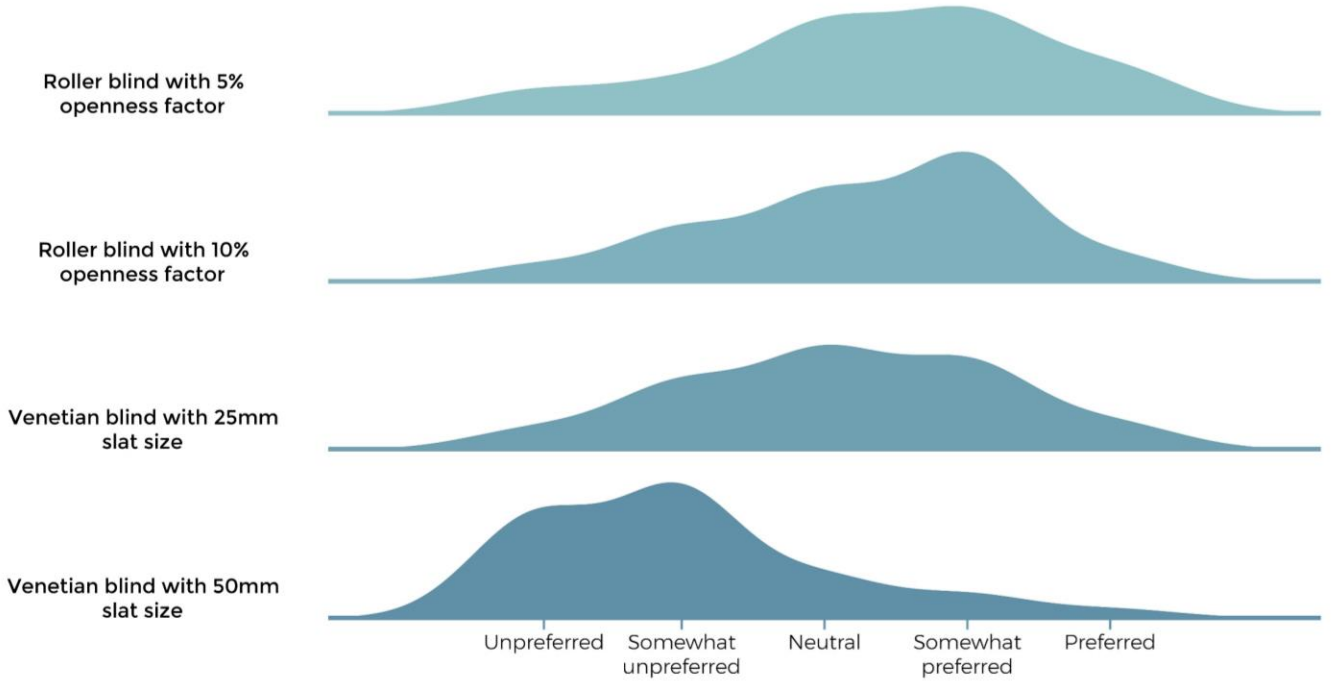
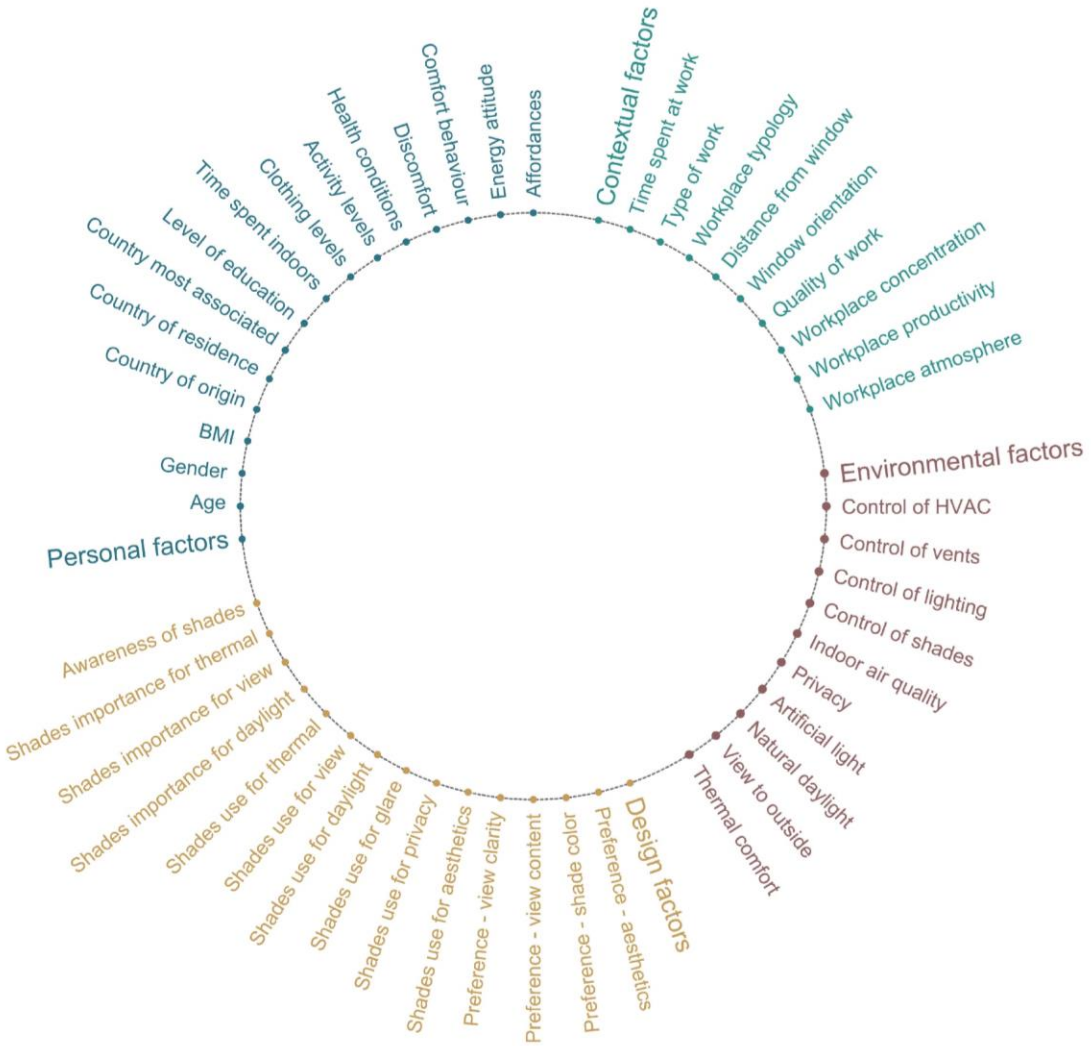


[03] Factors affecting user preferences

Statistical analysis



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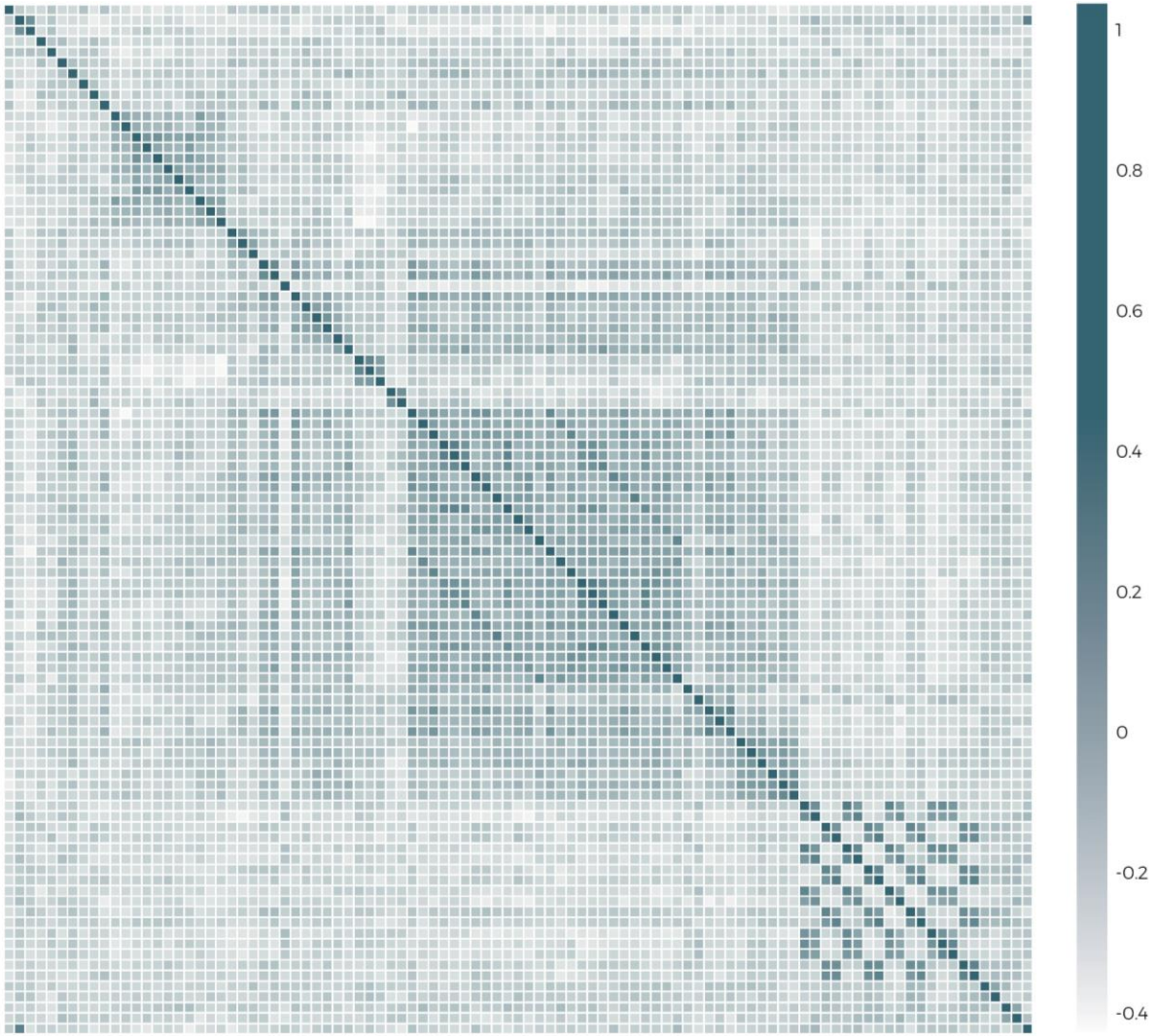

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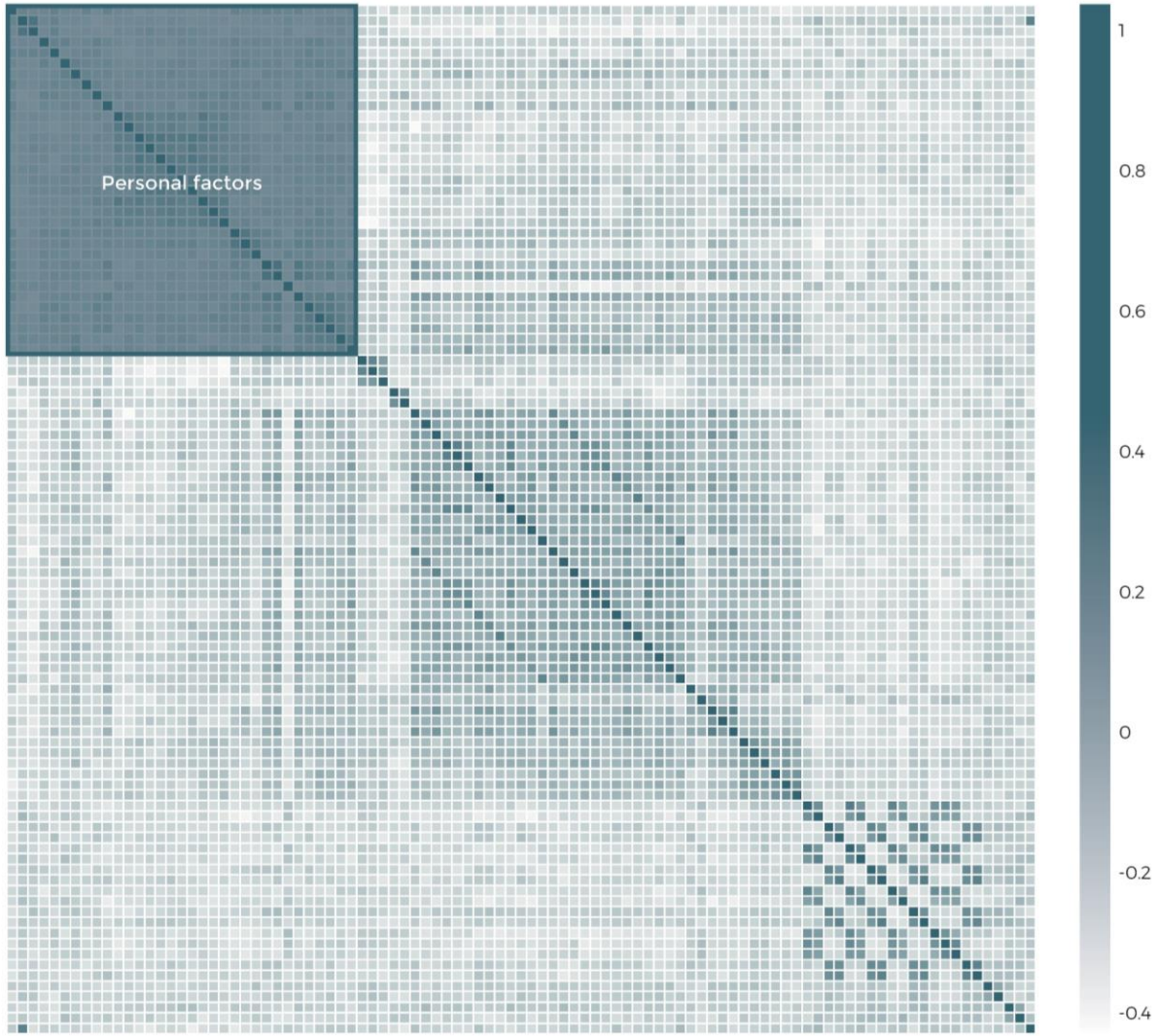
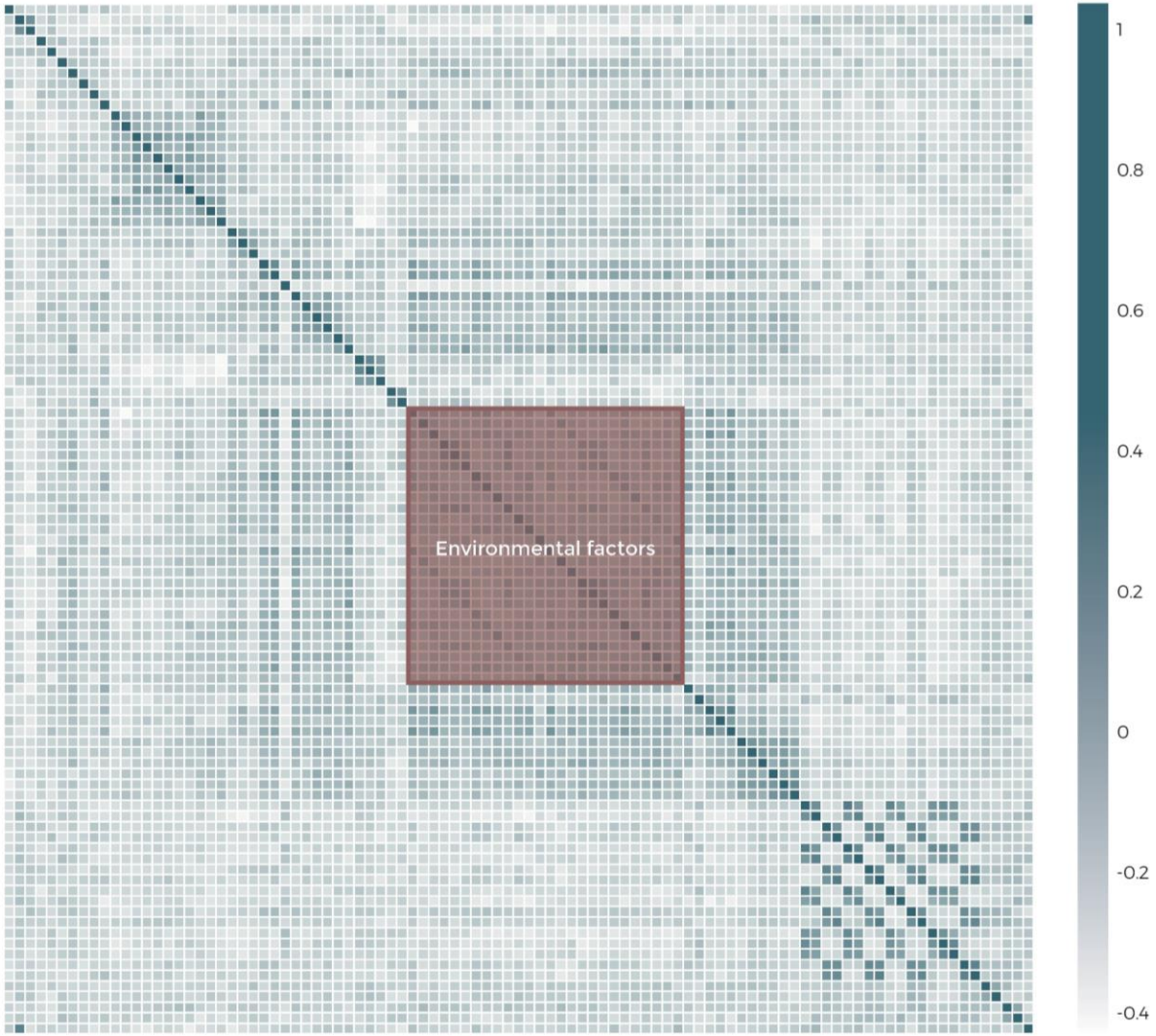


[03] Factors affecting user preferences

Statistical analysis

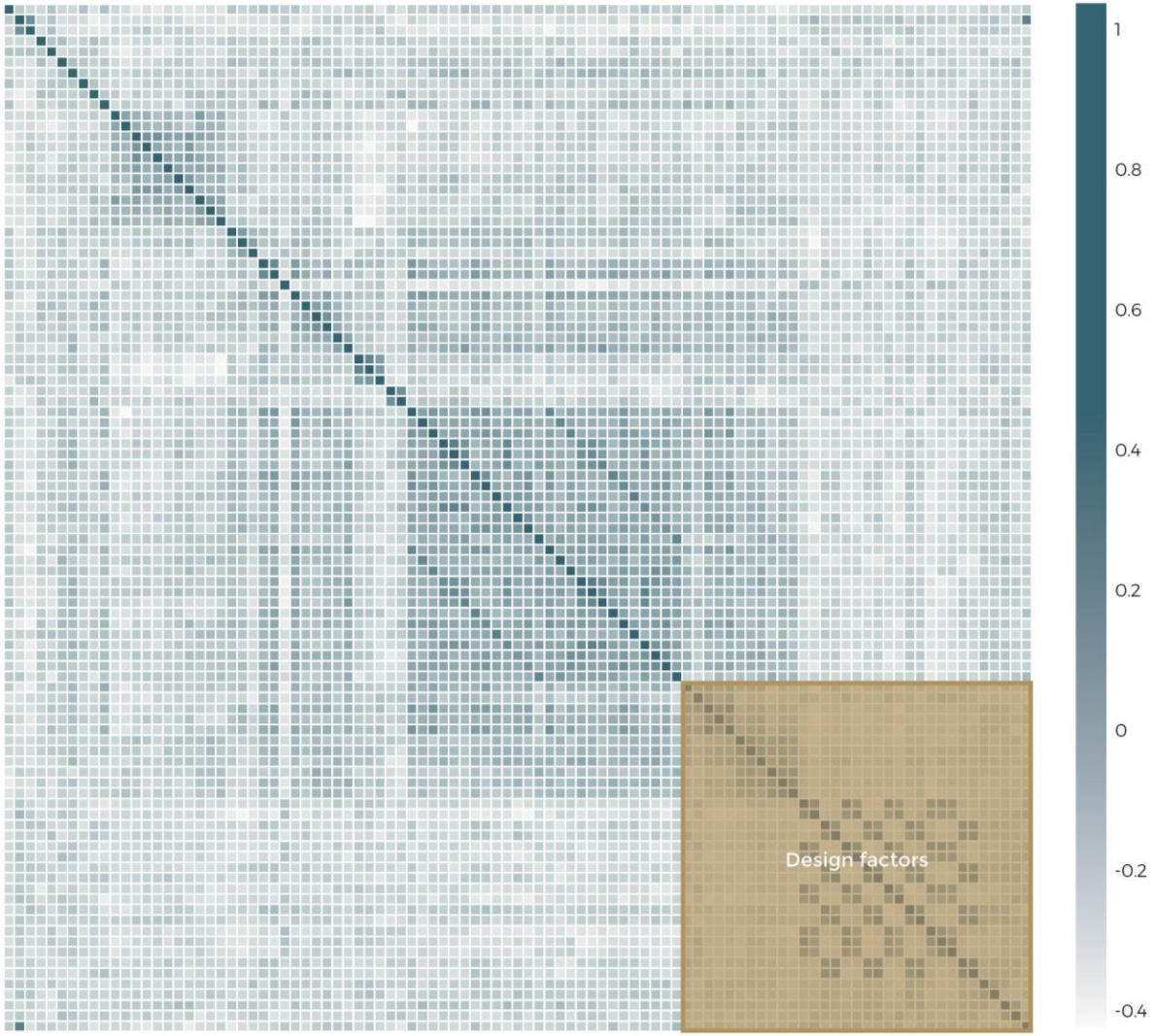
[03] Factors affecting user preferences

Statistical analysis



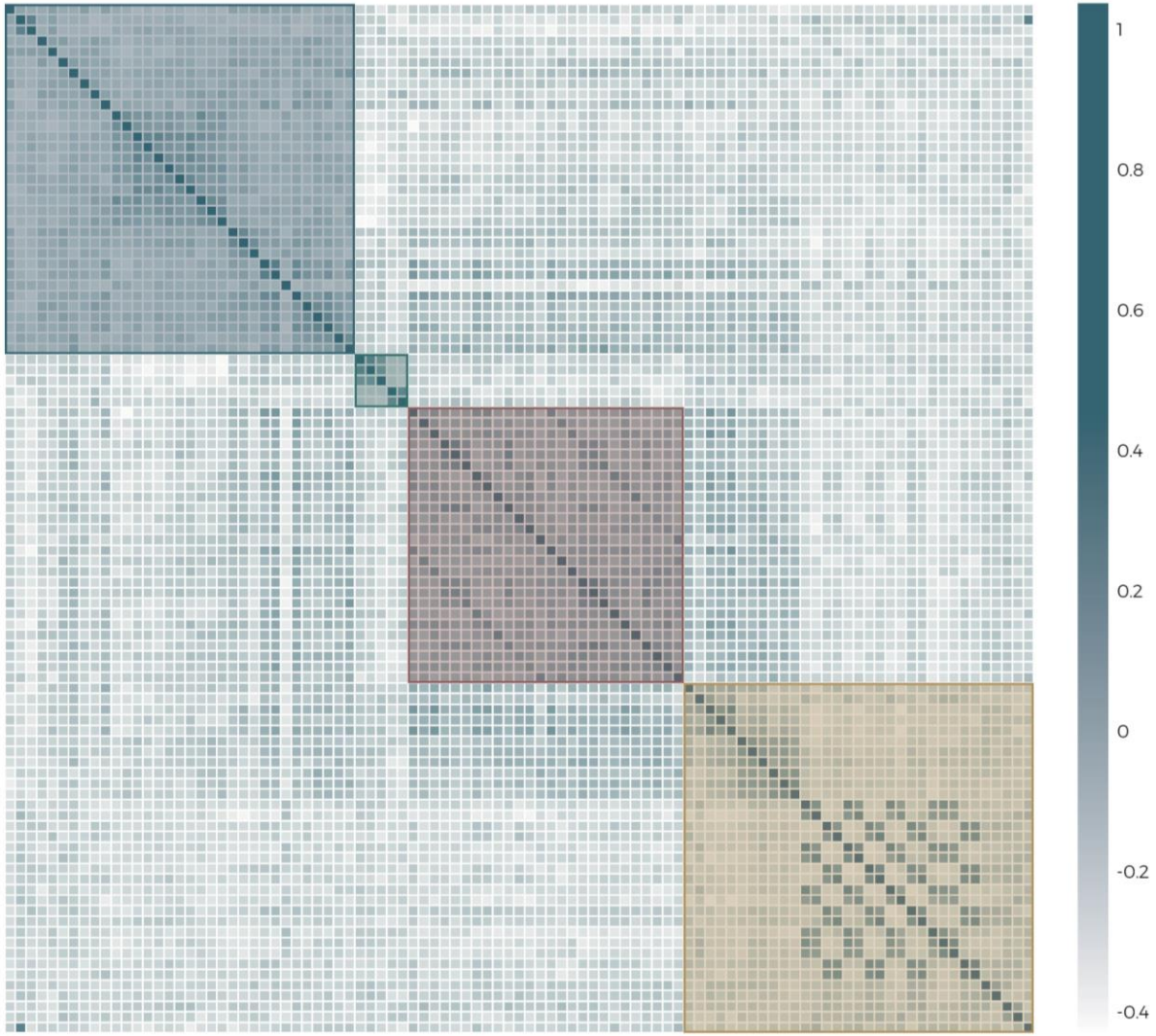
[03] Factors affecting user preferences

Statistical analysis



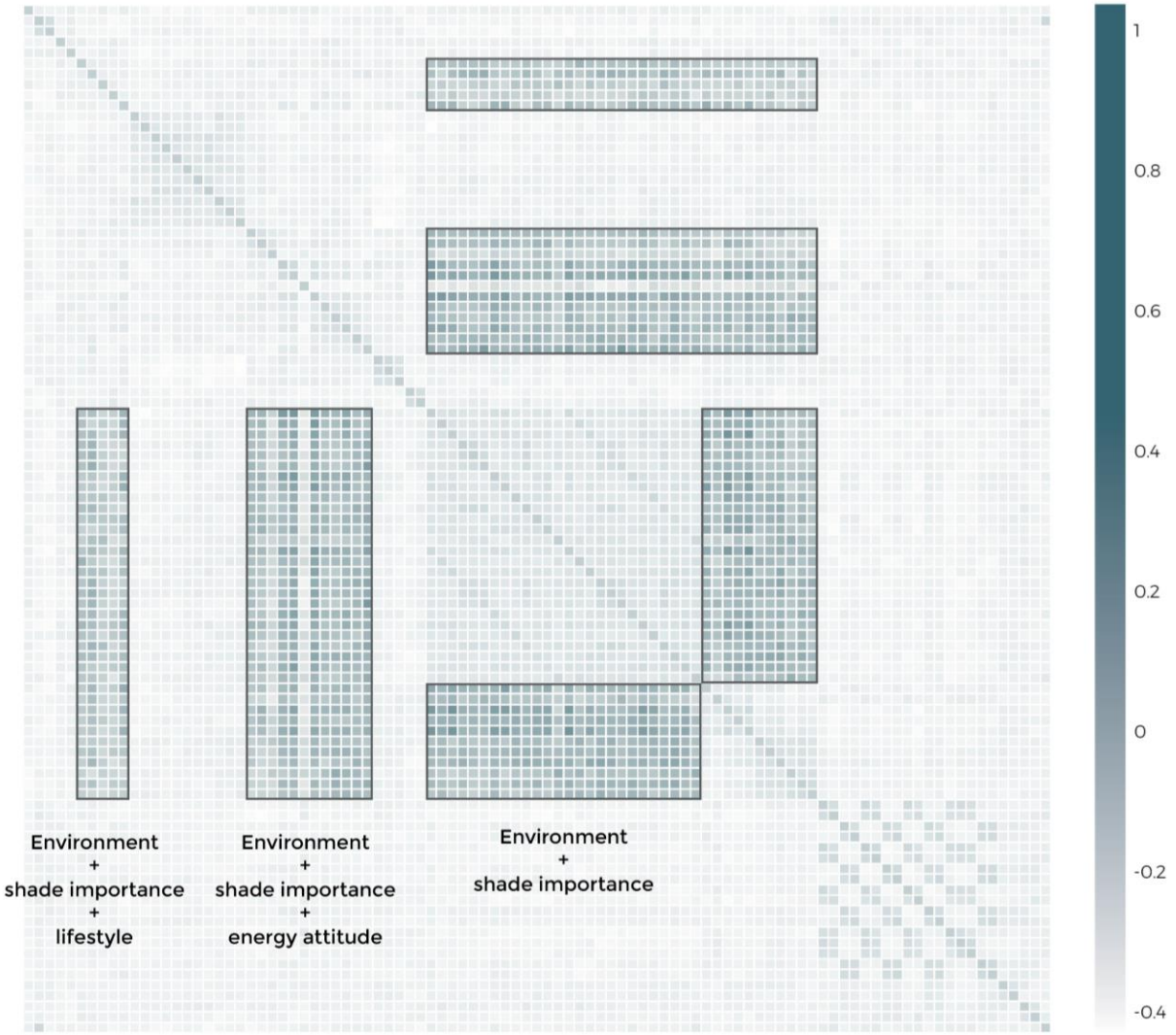
[03] Factors affecting user preferences

Statistical analysis



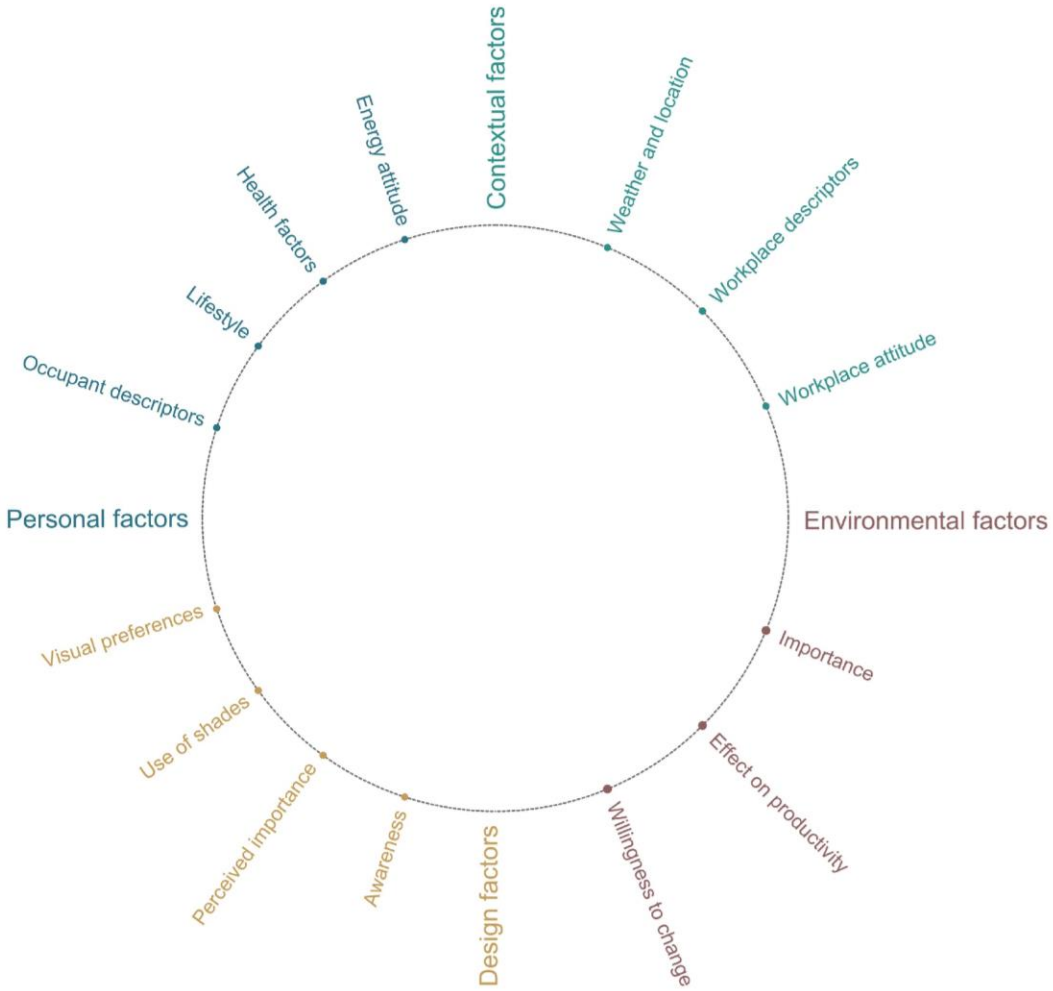
[03] Factors affecting user preferences

Statistical analysis



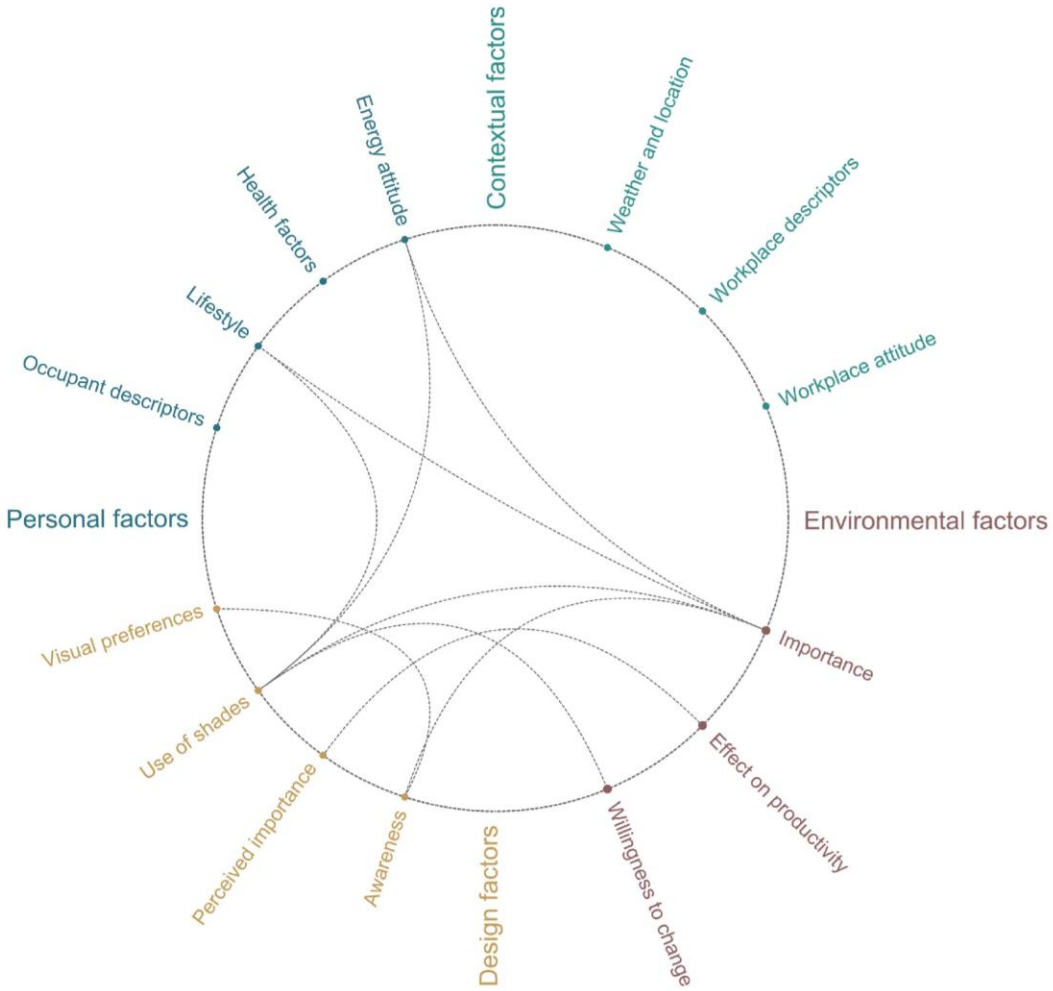
[03] Factors affecting user preferences

Feature selection



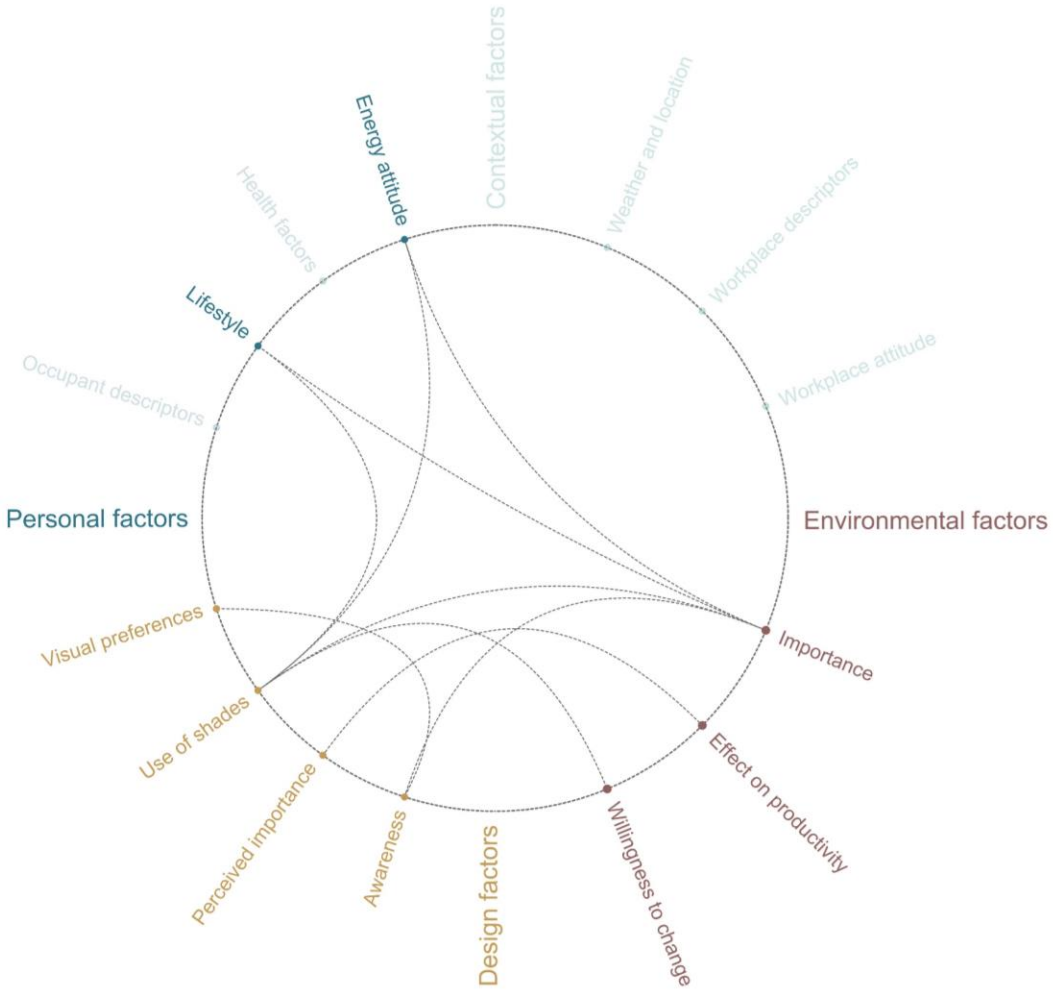
[03] Factors affecting user preferences

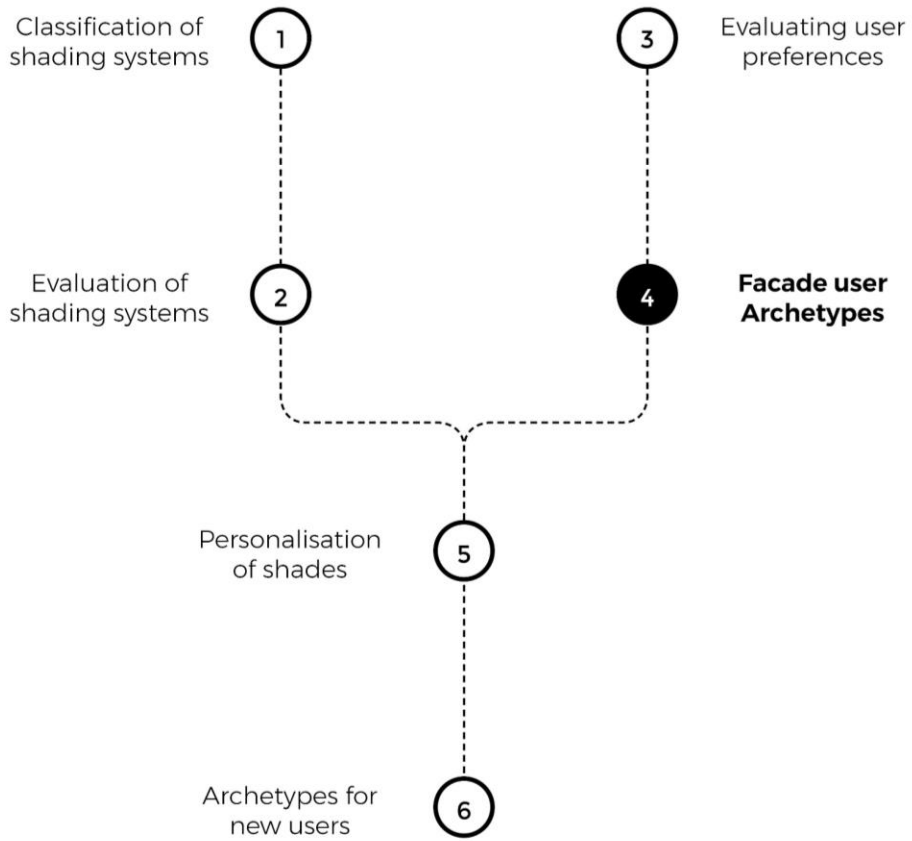
Feature selection



[03] Factors affecting user preferences

Feature selection




Classification of shading systems
1
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Evaluating user preferences
Evaluation of shading systems
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Facade user Archetypes
Personalisation of shades
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Archetypes for new users
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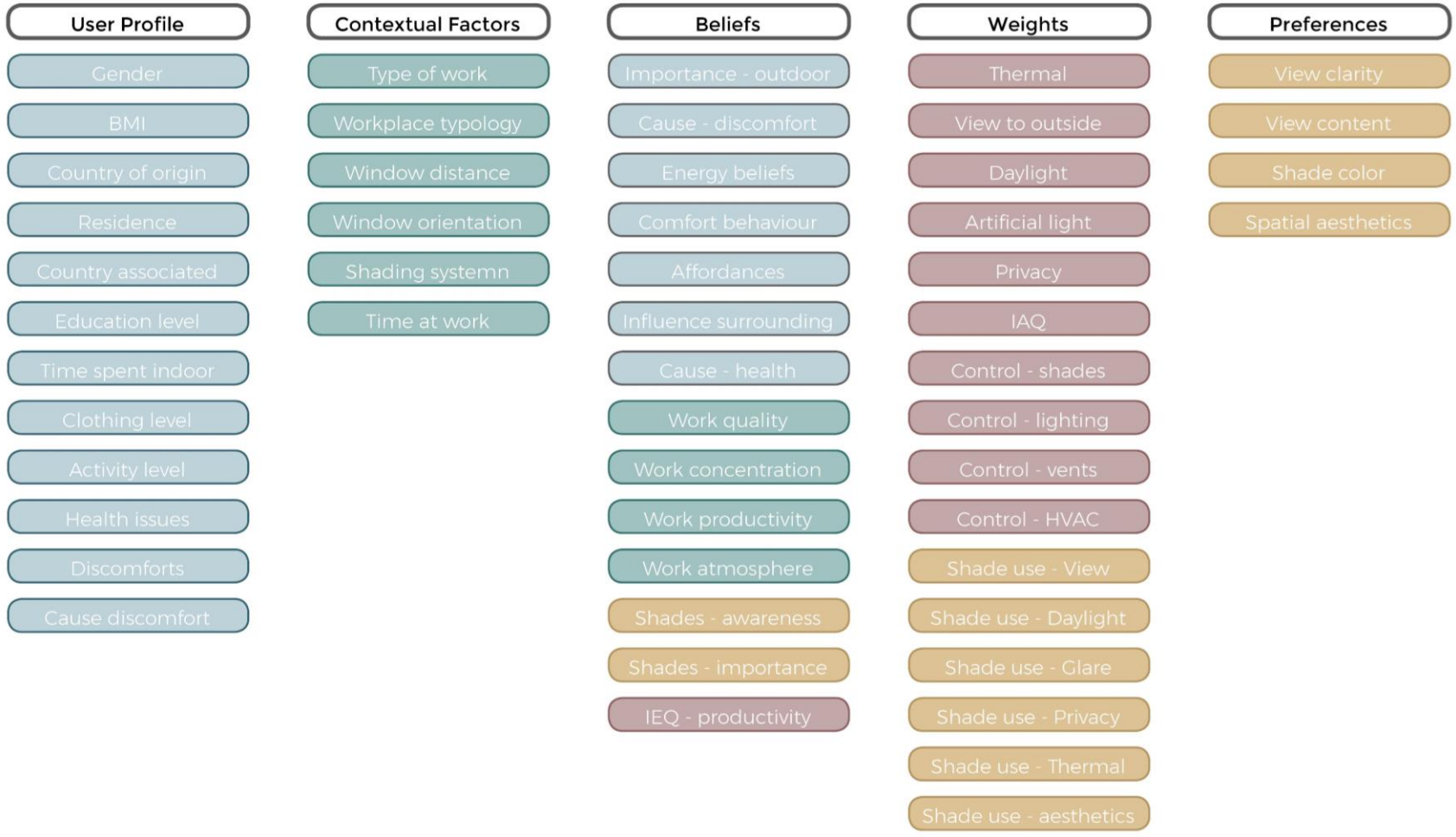
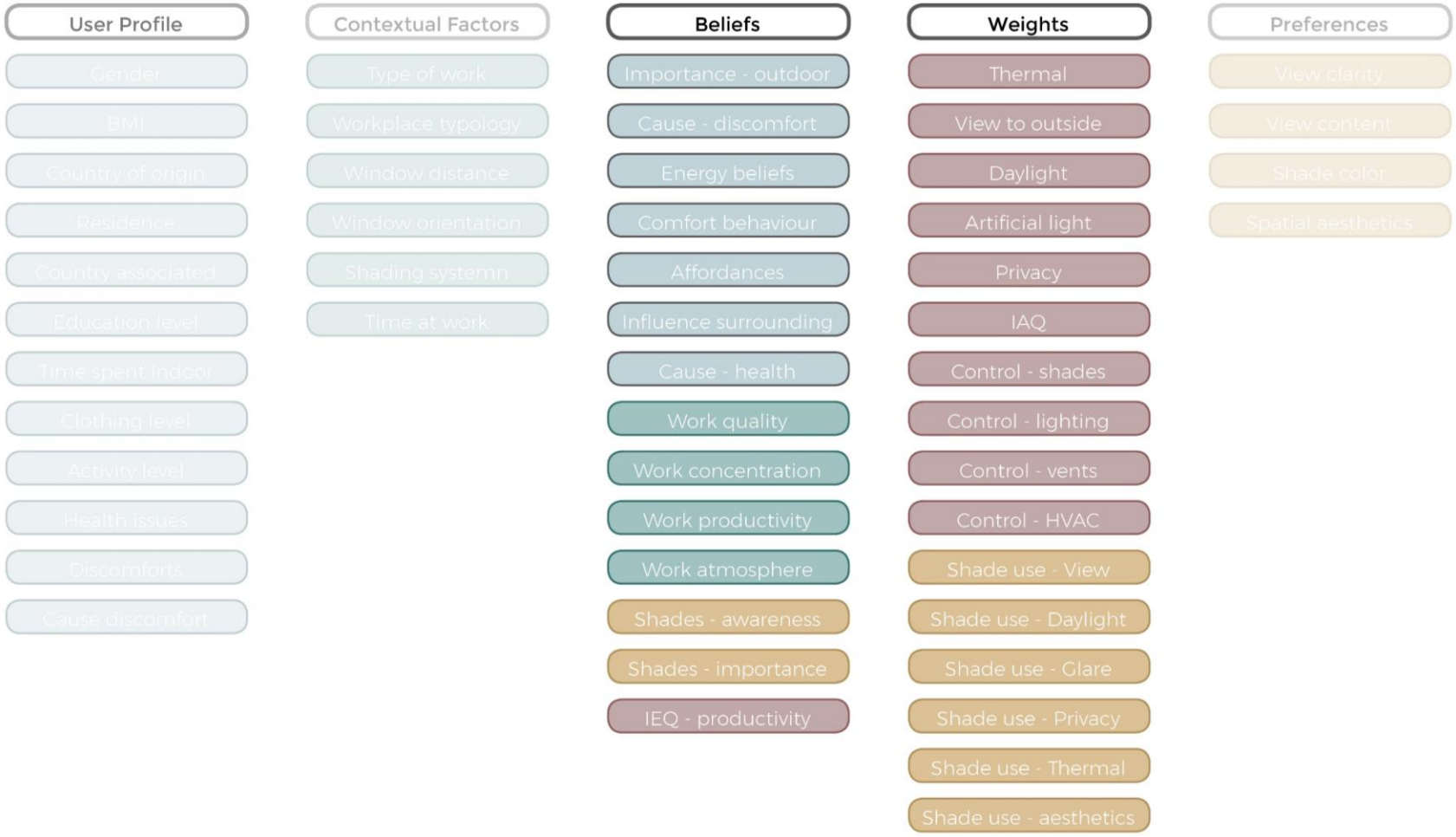
[04] Façade user Archetypes

Feature selection



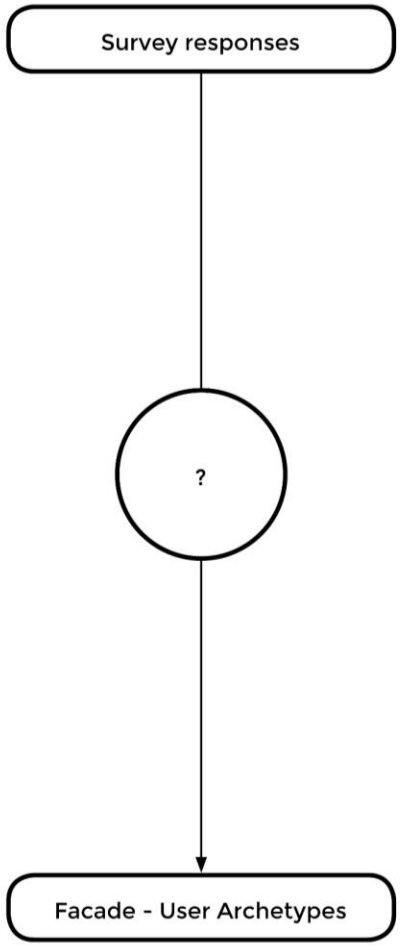
[04] Façade user Archetypes

Feature selection



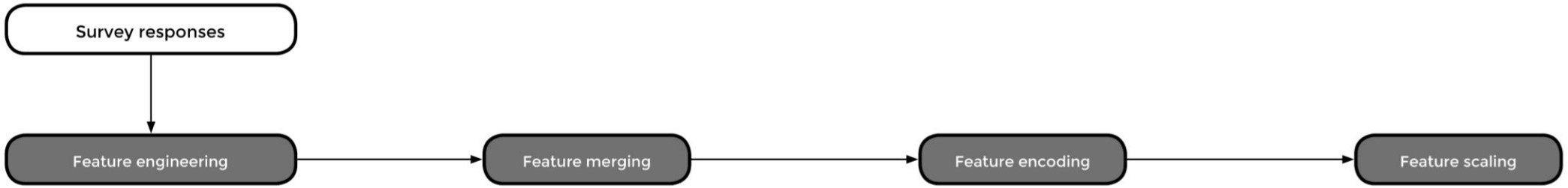
[04] Façade user Archetypes

Archetype Development



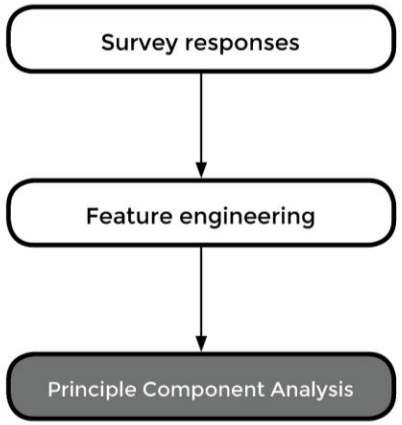
[04] Façade user Archetypes

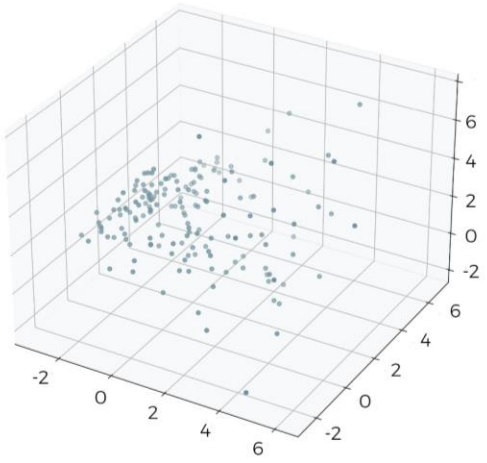
Archetype Development



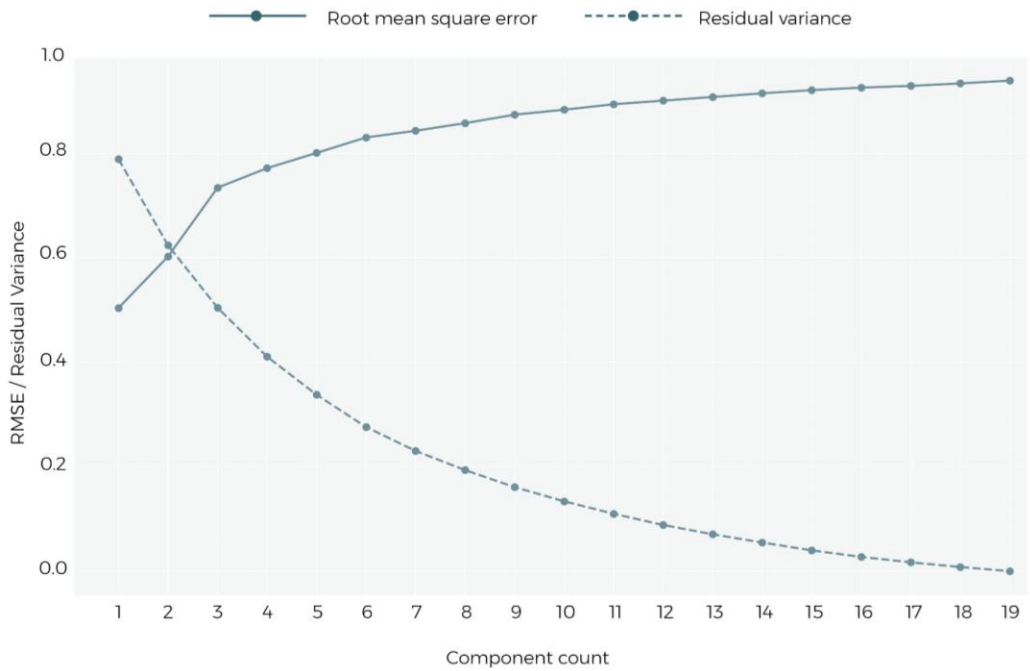
[04] Façade user Archetypes

Archetype Development





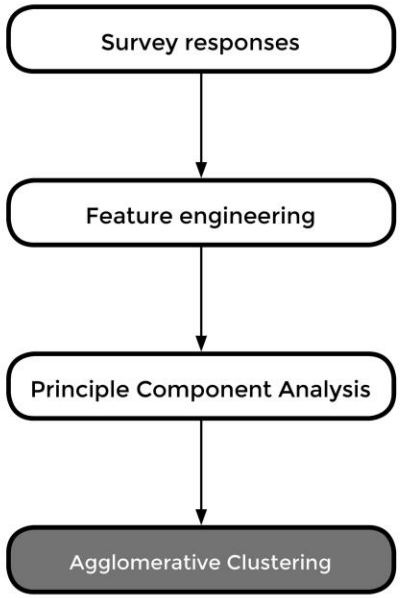
Sample points in
3 - dimensional plot

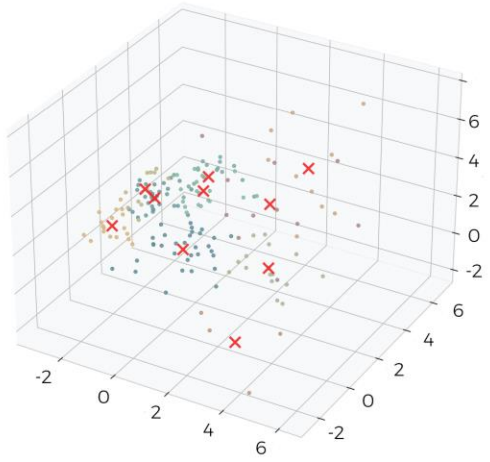


RMSE and Explained
Variance plot

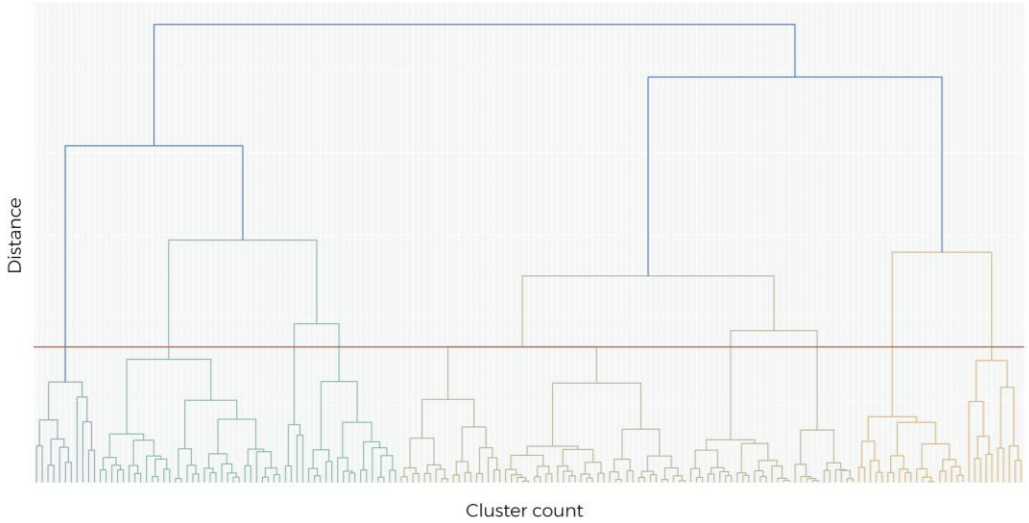
[04] Façade user Archetypes

Archetype Development





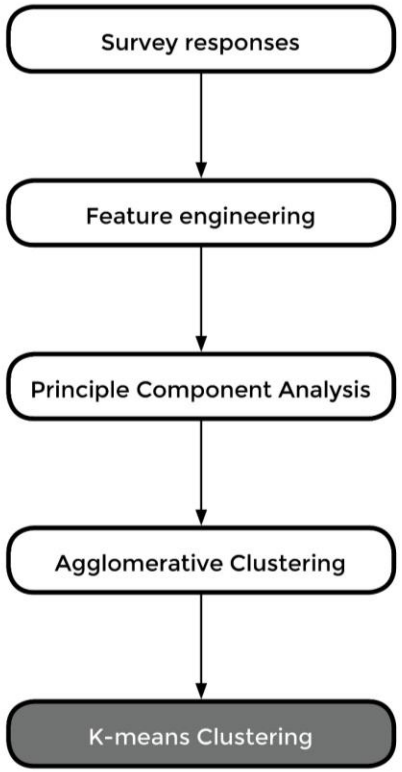
10 clusters

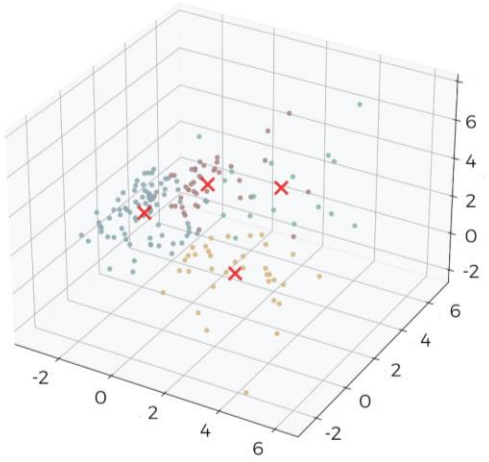


Dendrogram

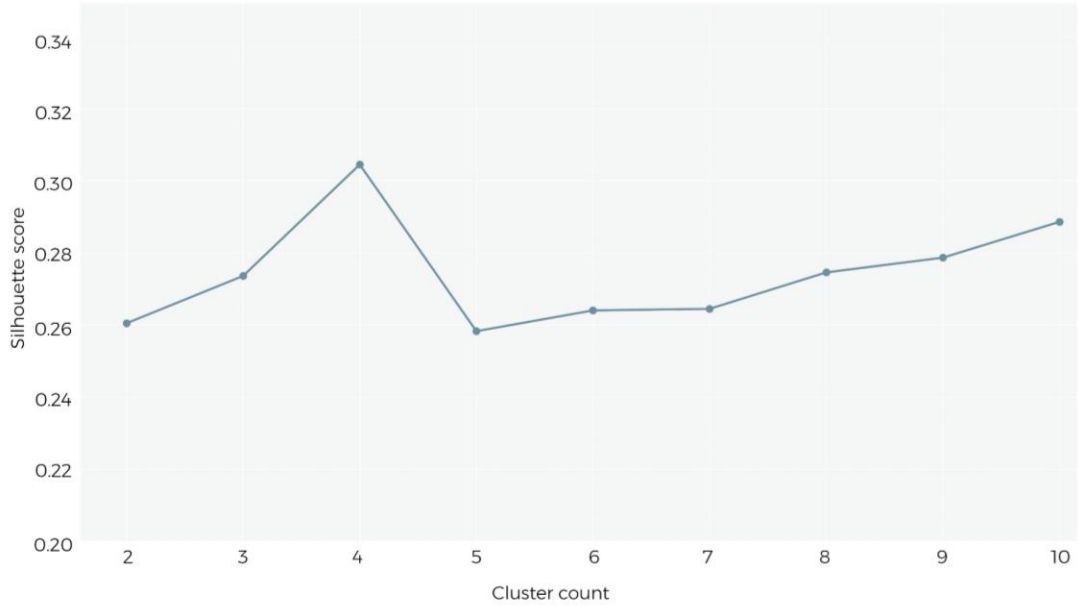
[04] Façade user Archetypes

Archetype Development





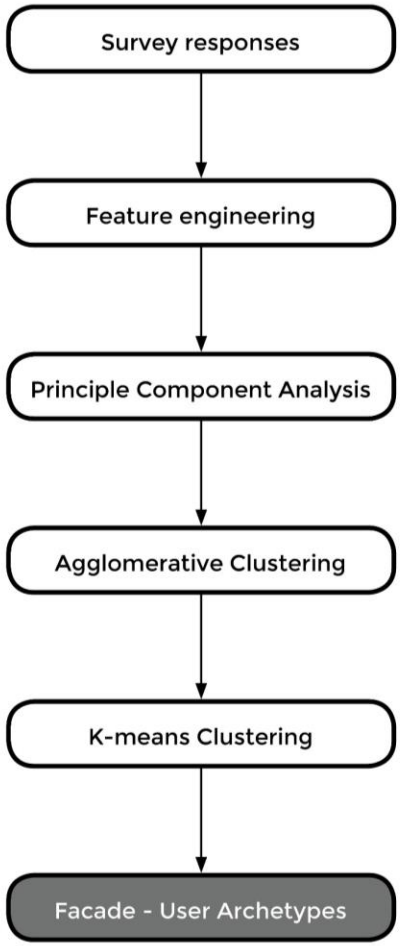
K-means clustering

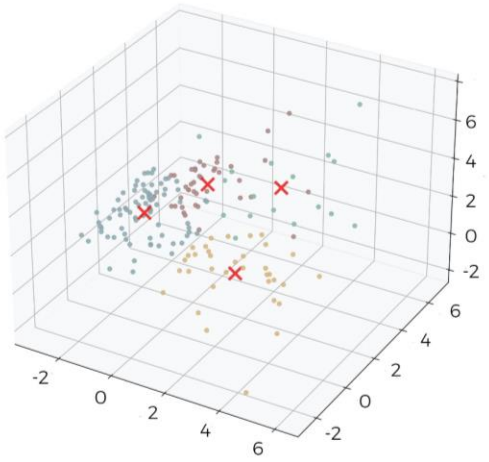


Silhouette score

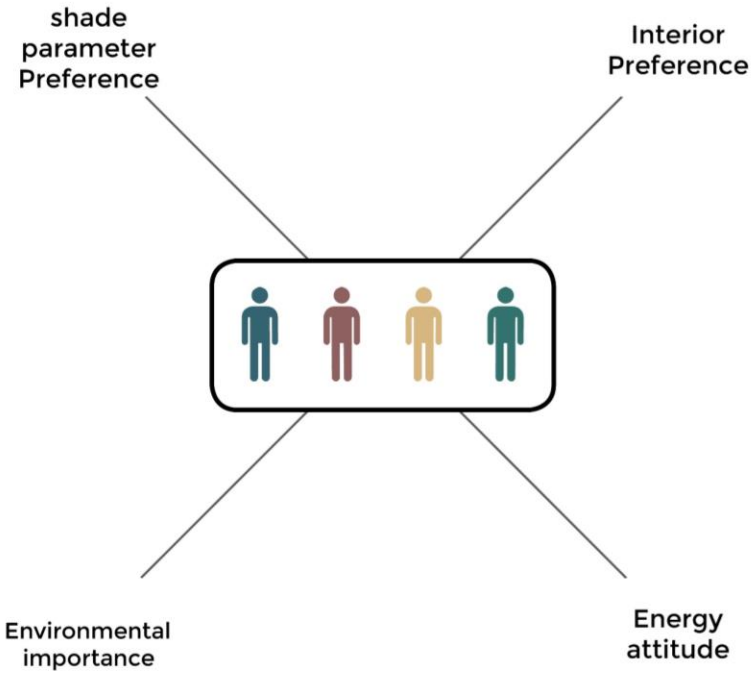
[04] Façade user Archetypes

Archetype Development



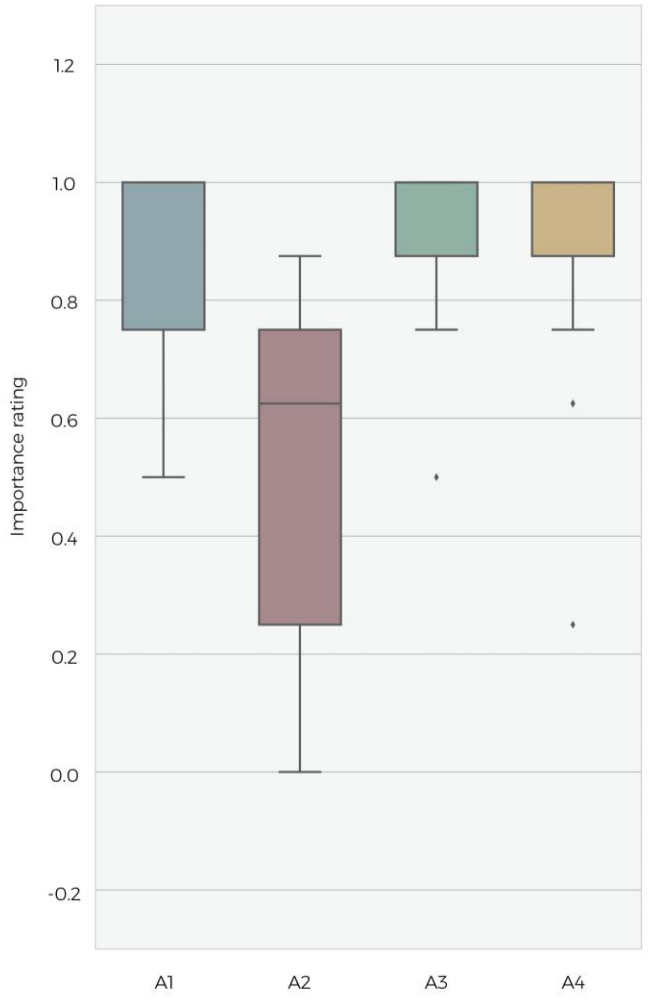


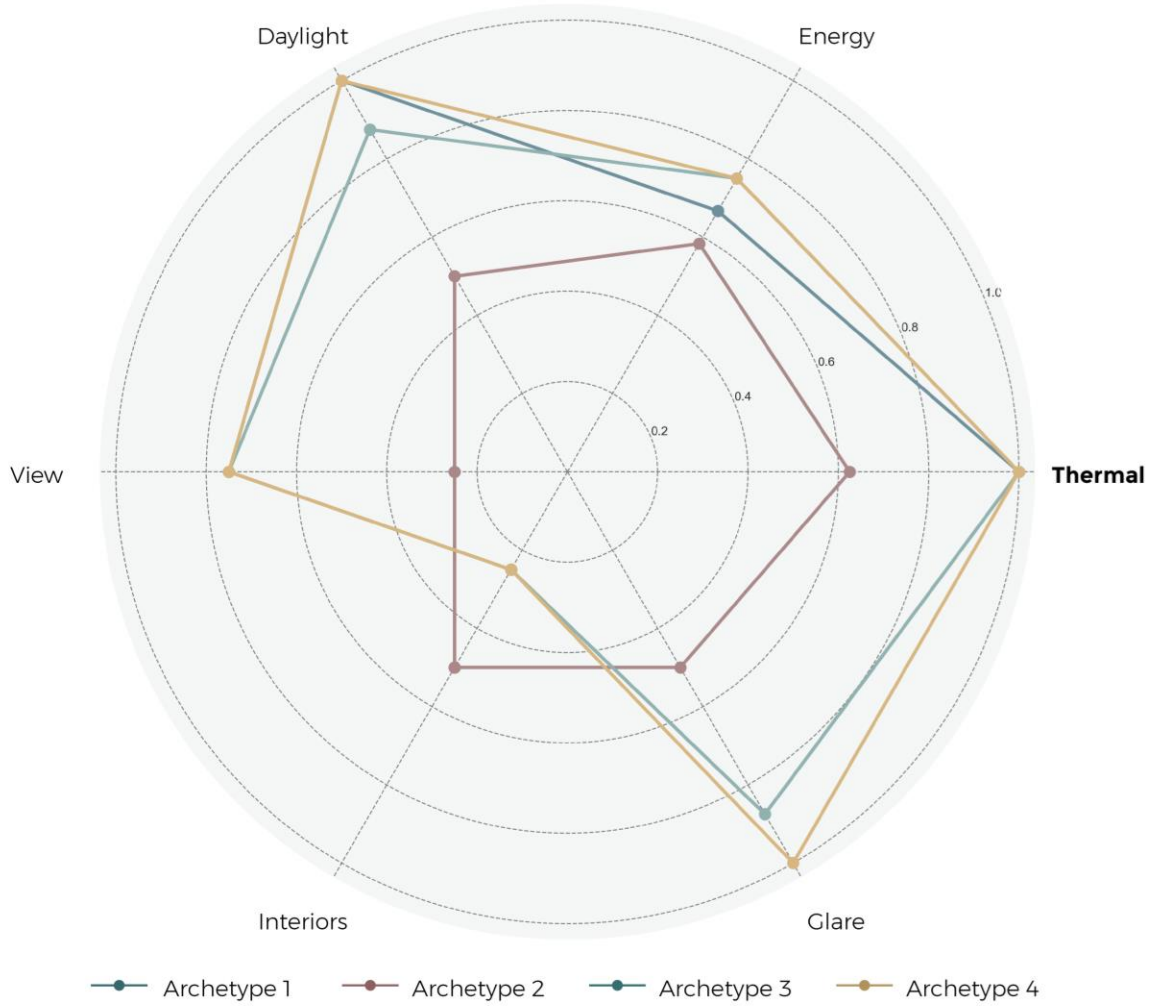
Designed Archetypes

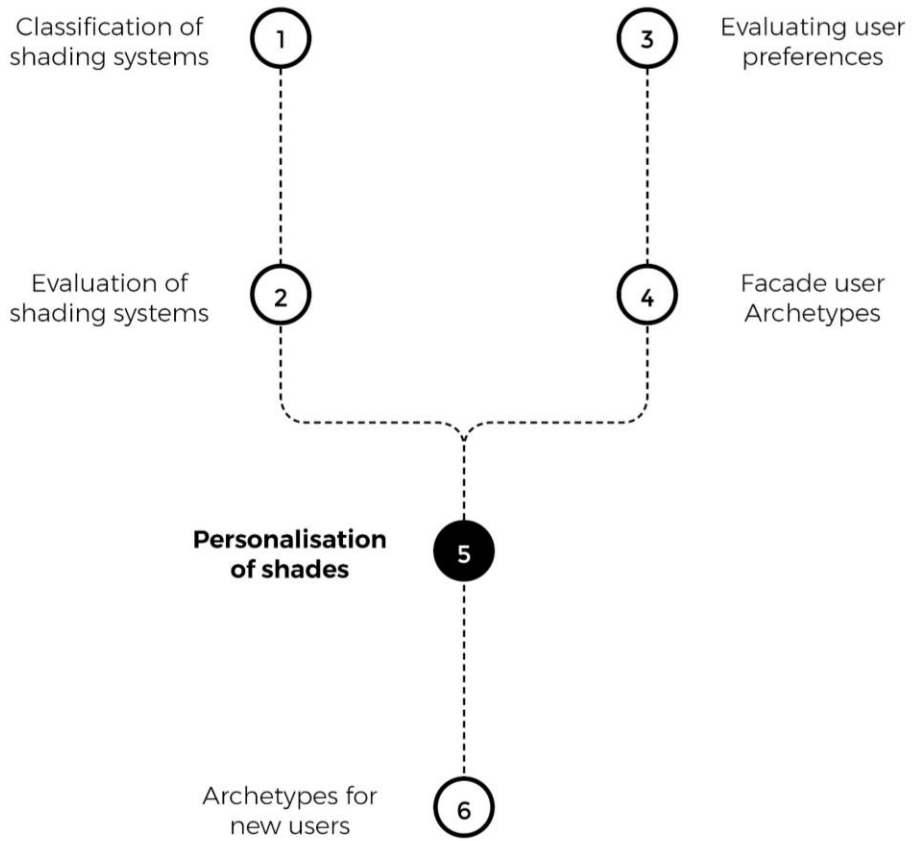


[04] Façade user Archetypes

Archetype Description



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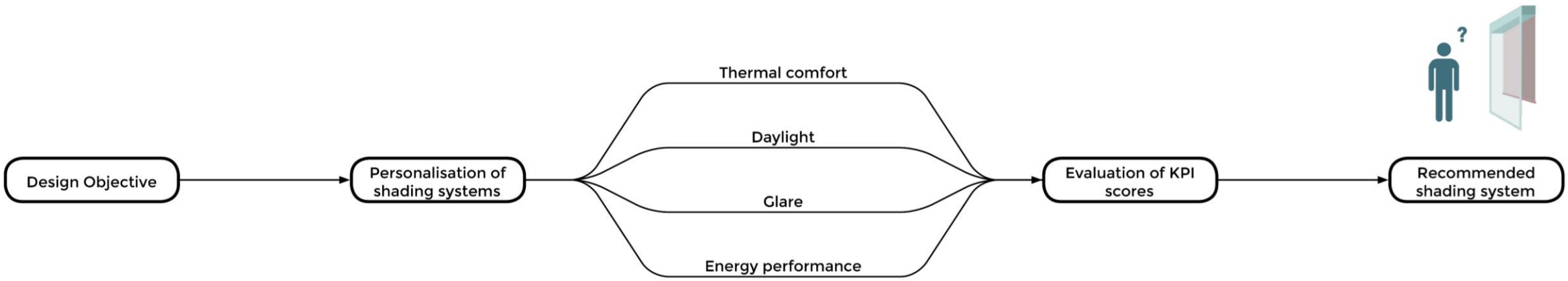
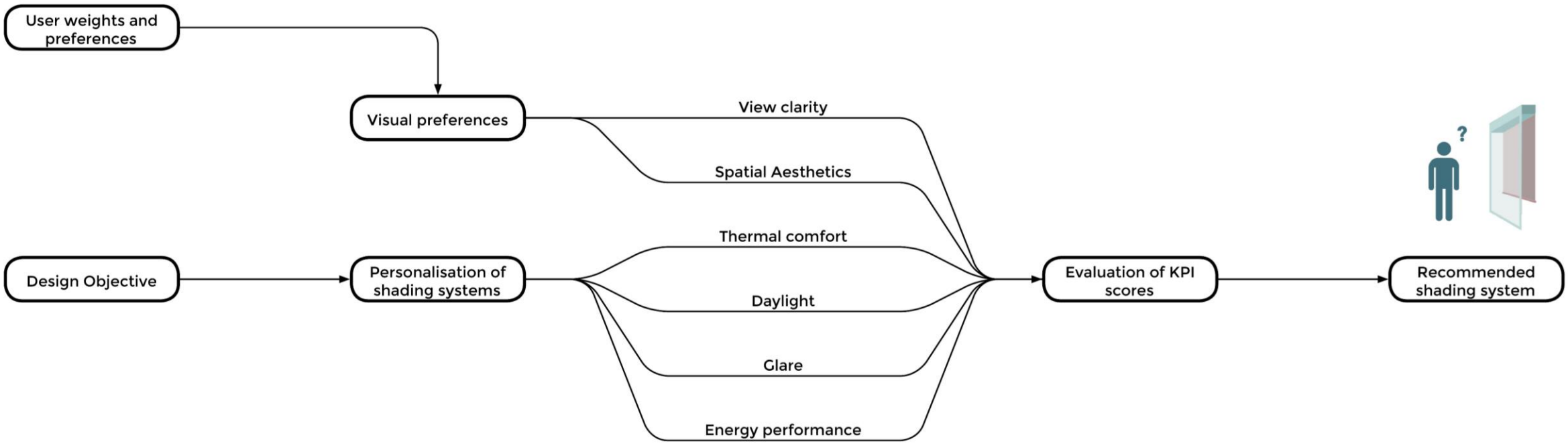
[05] Personalization of building shades

Objective evaluation



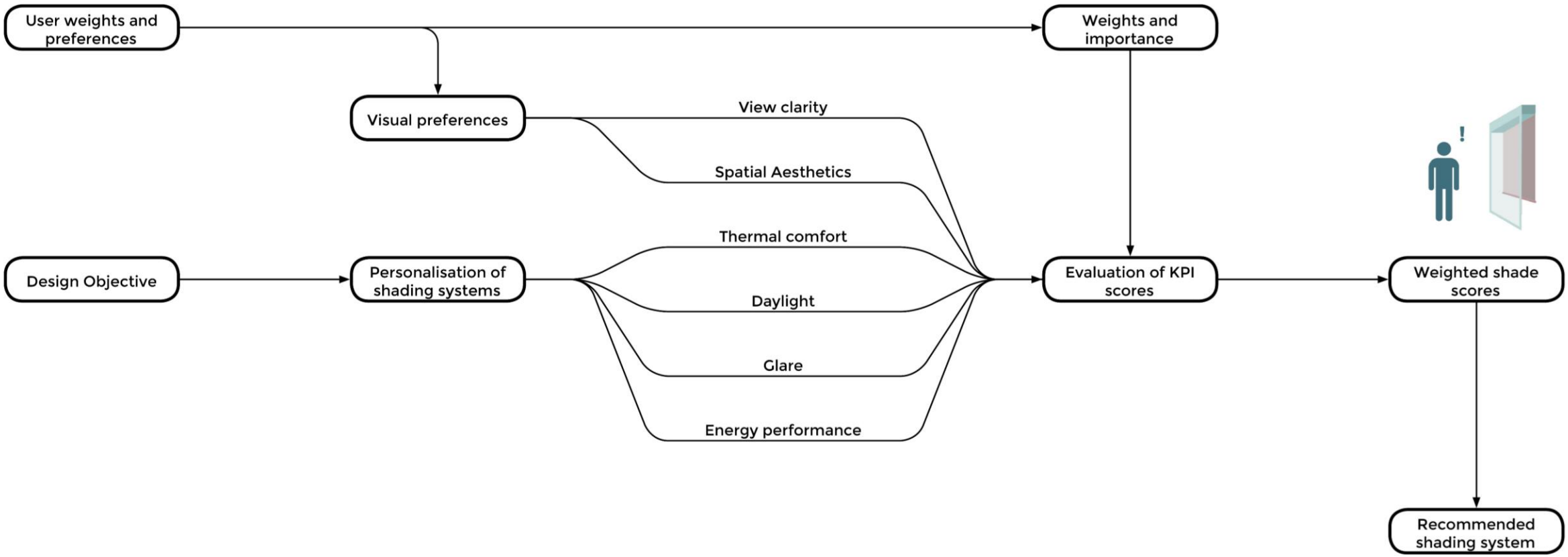
[05] Personalization of building shades

Integrating user preferences



[05] Personalization of building shades

Integrating user preferences

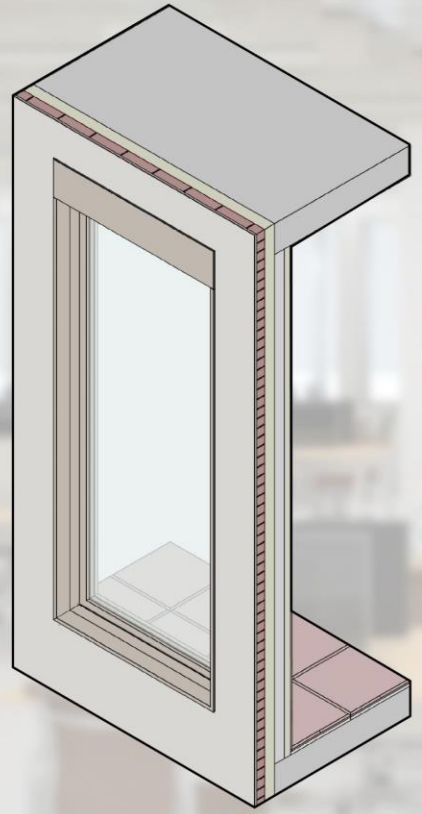


[05] Personalization of building shades

Objective evaluation

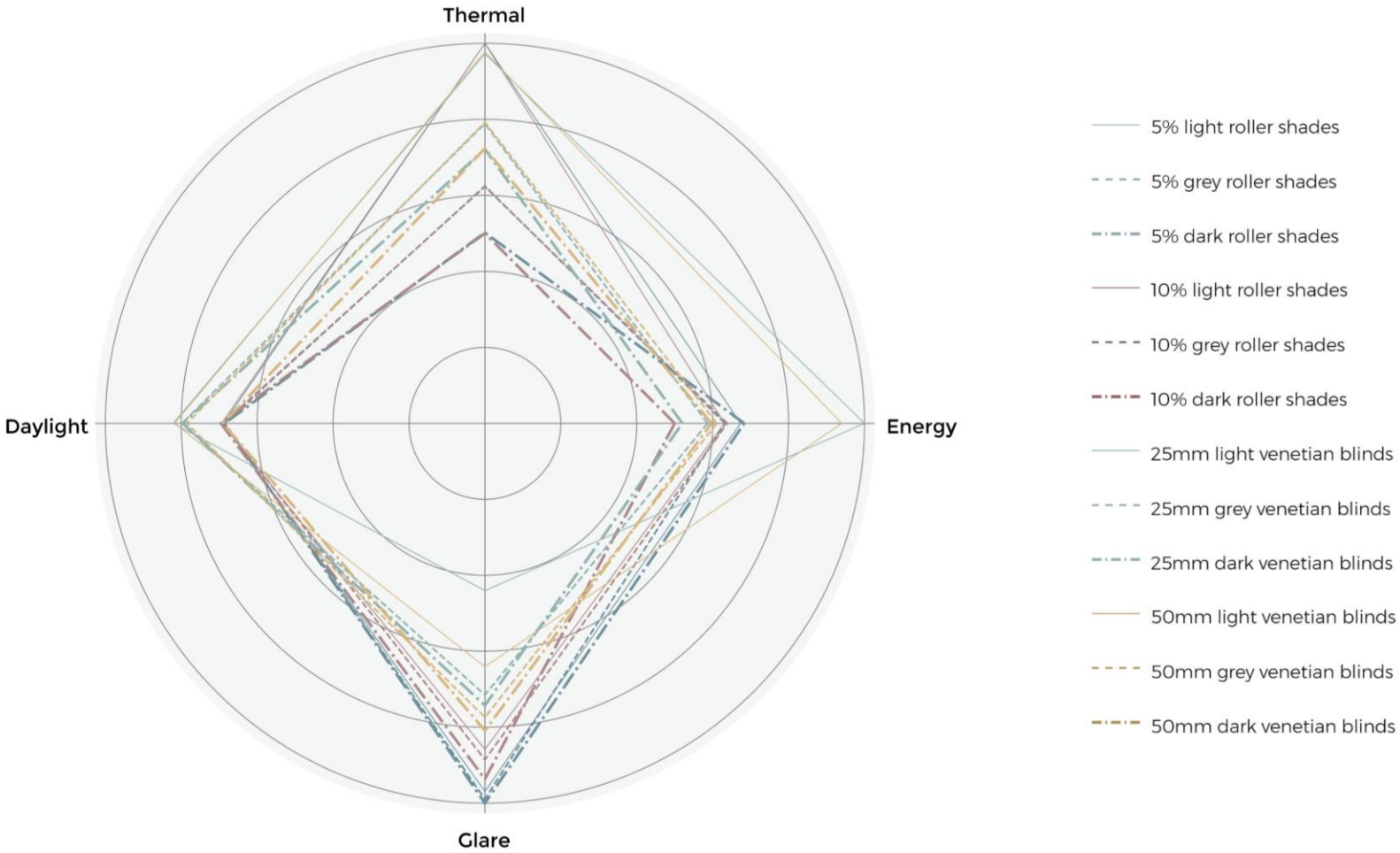
Base Scenario

East Facing Facade



[05] Personalization of building shades

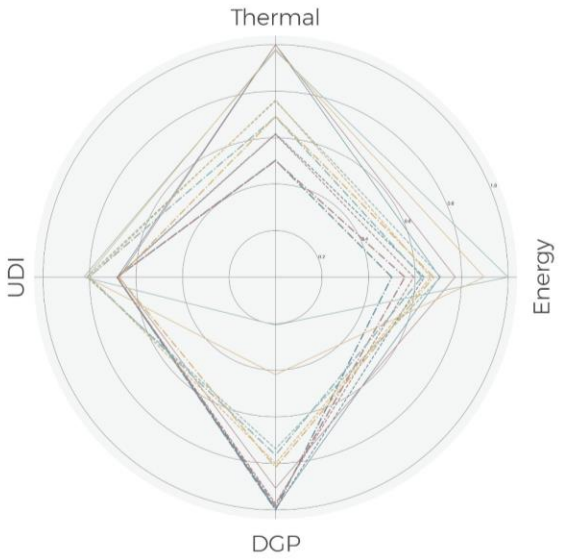
Objective evaluation



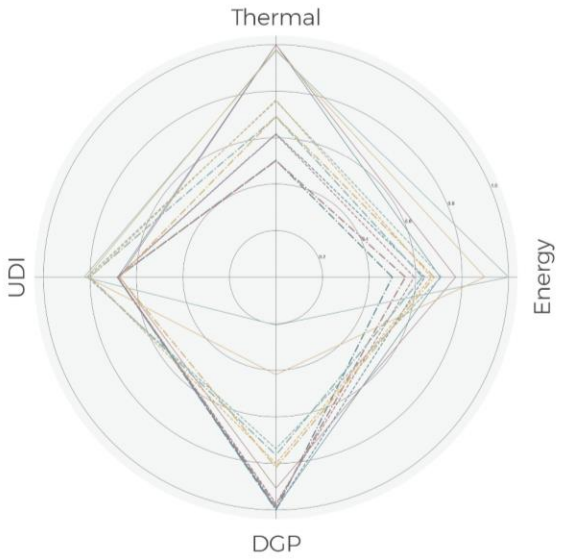
[05] Personalization of building shades

Objective evaluation

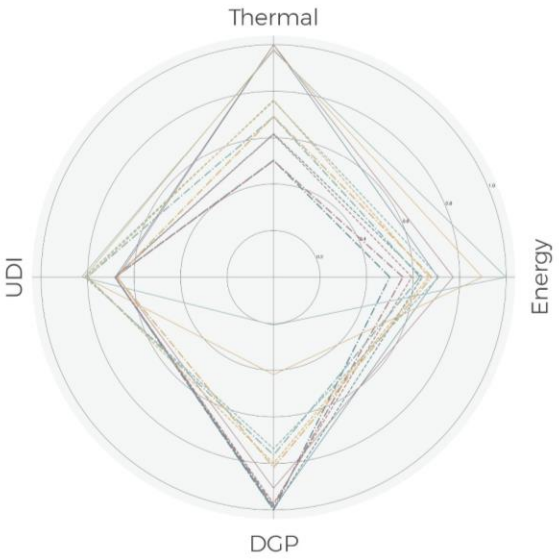
Archetype 1



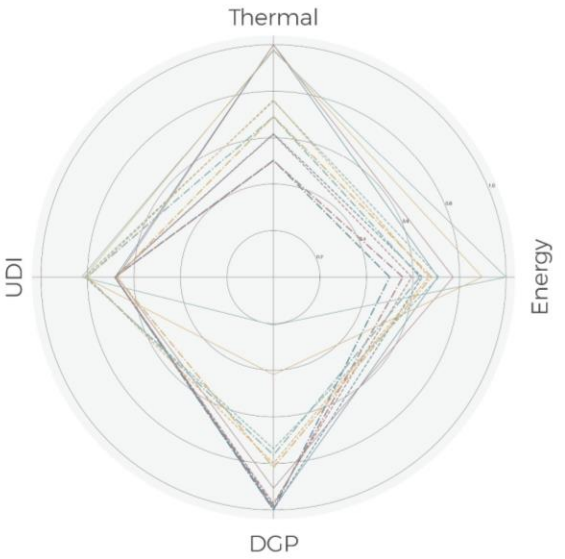
Archetype 2



Archetype 3



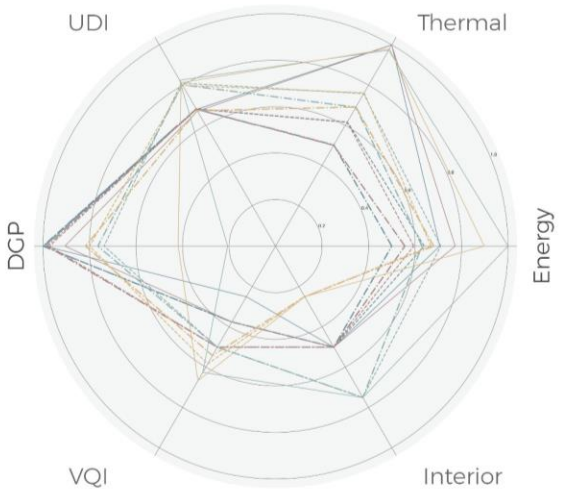
Archetype 4



[05] Personalization of building shades

Integrating user preferences

Archetype 1



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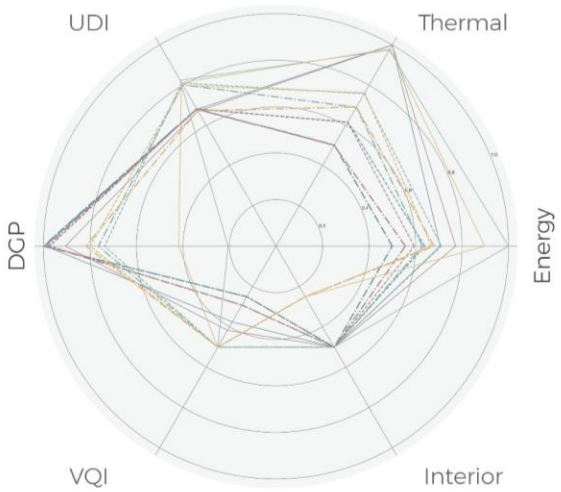
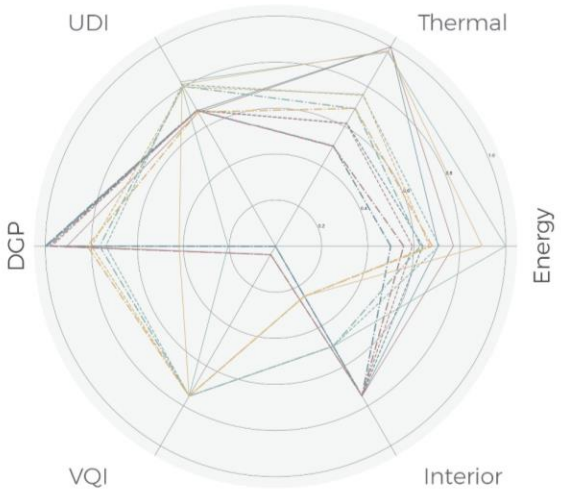
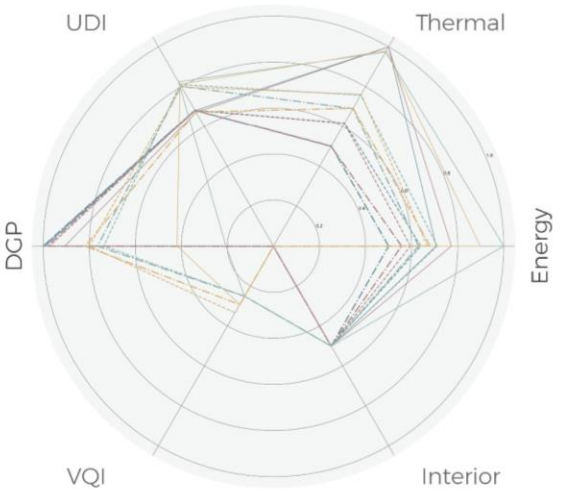


Archetype 3



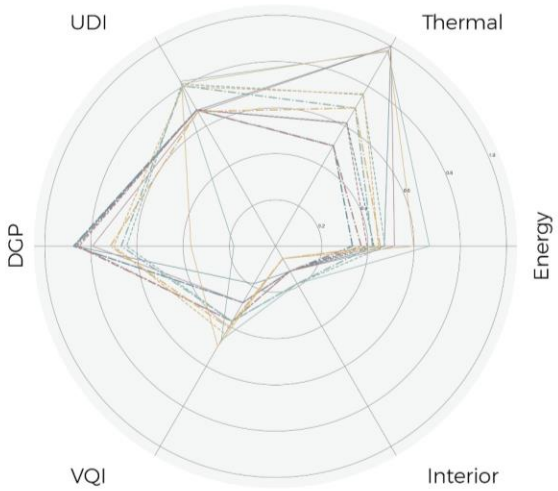
Archetype 4



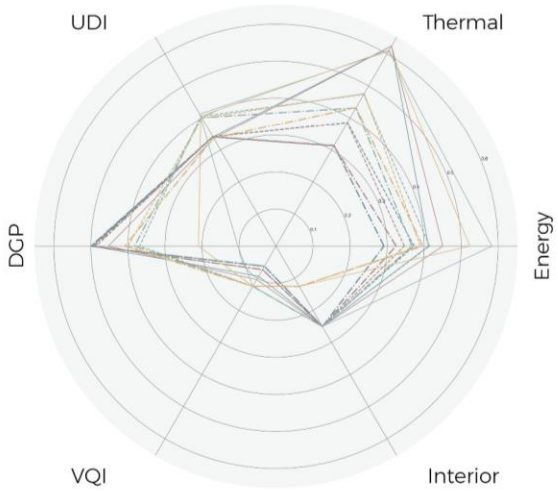
[05] Personalization of building shades

Integrating user preferences

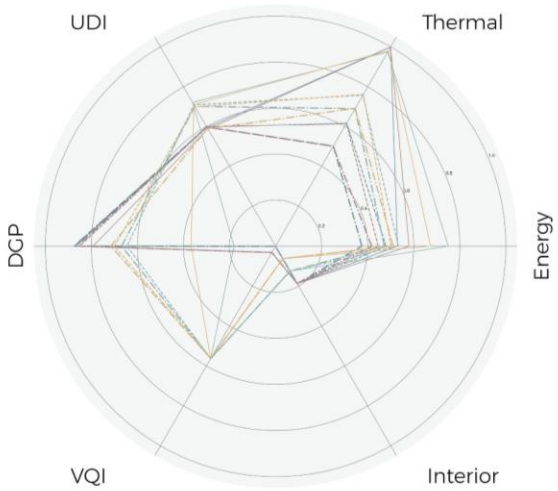
Archetype 1



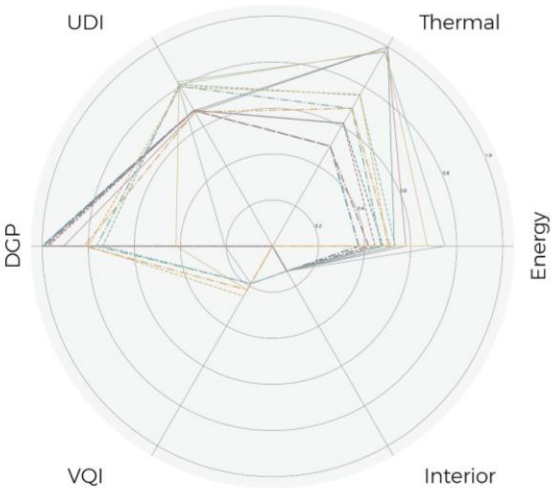
Archetype 2



Archetype 3



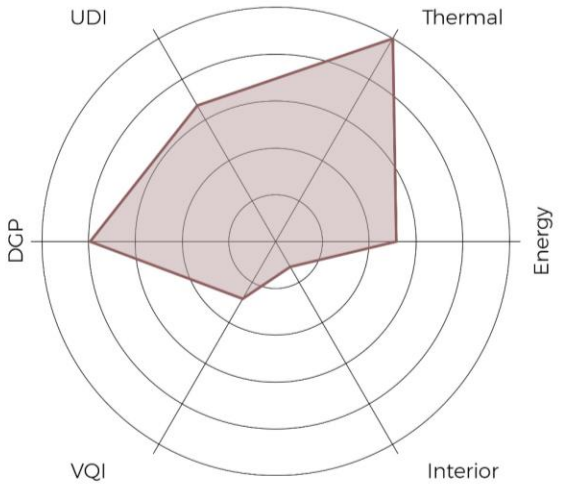
Archetype 4



[05] Personalization of building shades

Integrating user preferences

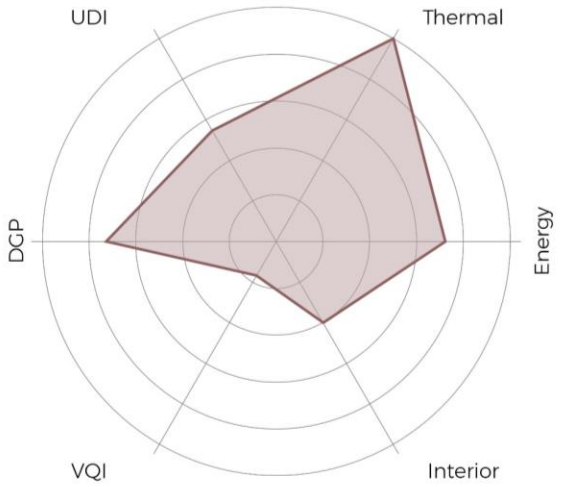
Archetype 1



Recommended shades

10% Light Roller shades

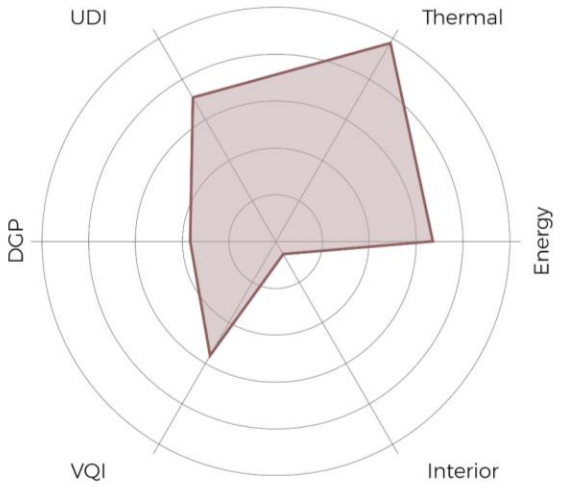
Archetype 2



Recommended shades

10% Light Roller shades

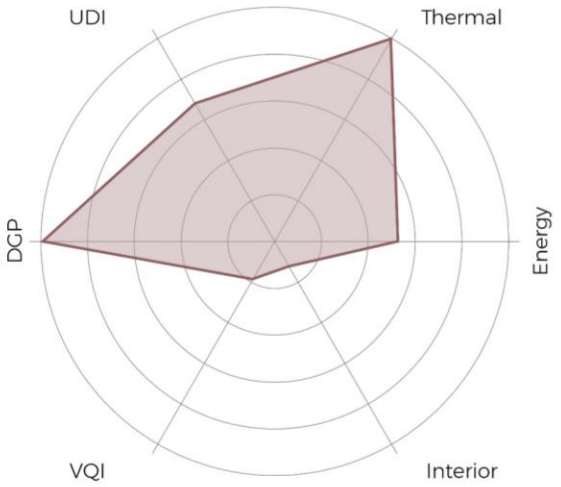
Archetype 3



Recommended shades

50mm slat Light Venetian Blinds

Archetype 4



Recommended shades

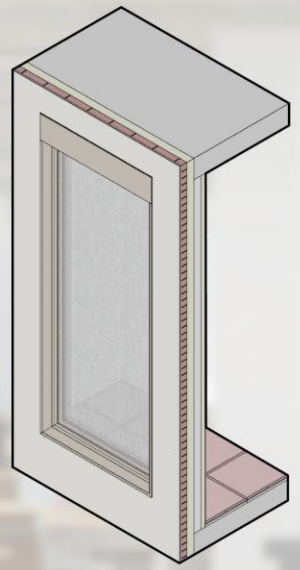
5% Light Roller shades

[05] Personalization of building shades

Shade recommendation for Archetype 1 and 2

Recommended shade

10% light Roller shades



Slat width
10%

Transmittance
0.25

Reflectance
0.55

Absorptance
0.20

Performance

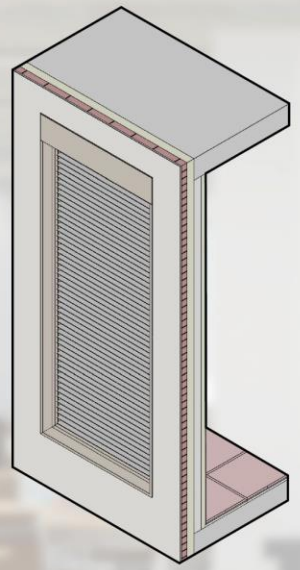
Energy	Thermal	Daylight	Glare
115.80 kWh/m²	3255.77	37.56%	0.10

[05] Personalization of building shades

Shade recommendation for Archetype 3

Recommended shade

50mm wide light Venetian blinds



Slat width
50mm

Transmittance
0.0

Reflectance
0.75

Absorptance
0.25

Performance

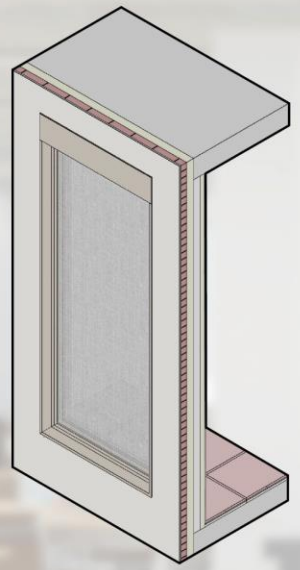
Energy	Thermal	Daylight	Glare
116.05 kWh/m²	3255.72	38.05%	0.01

[05] Personalization of building shades

Shade recommendation for Archetype 4

Recommended shade

5% light Roller shades



Slat width
5%

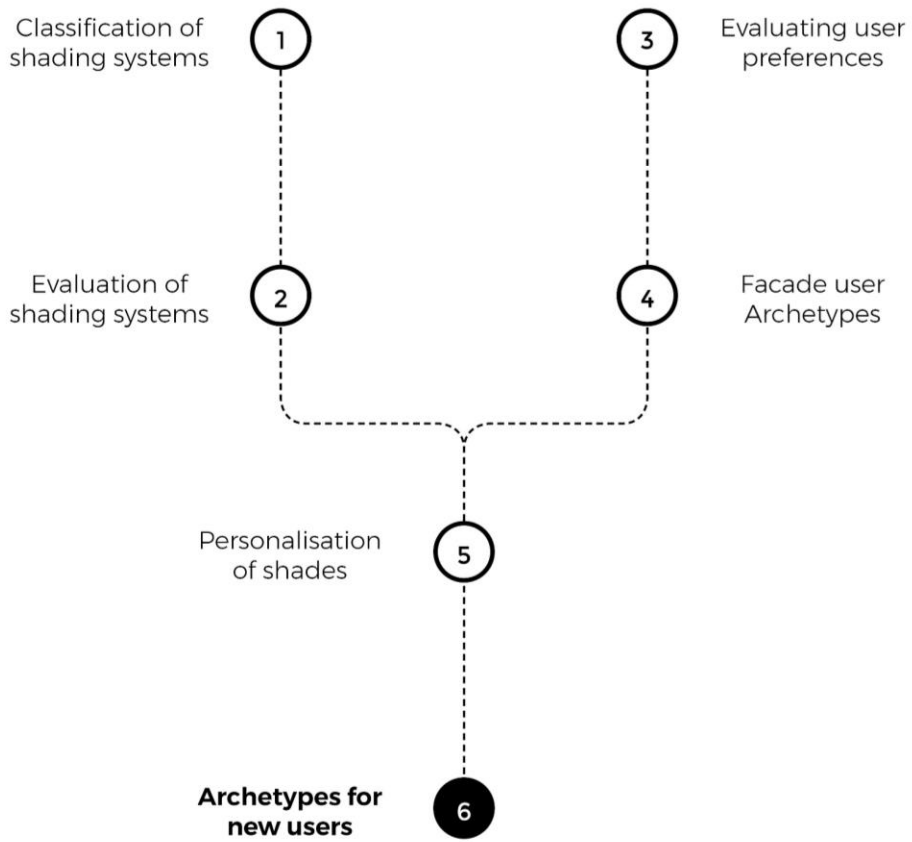
Transmittance
0.25

Reflectance
0.55

Absorptance
0.20

Performance

Energy	Thermal	Daylight	Glare
116.02 kWh/m²	3255.72	38.05%	0.01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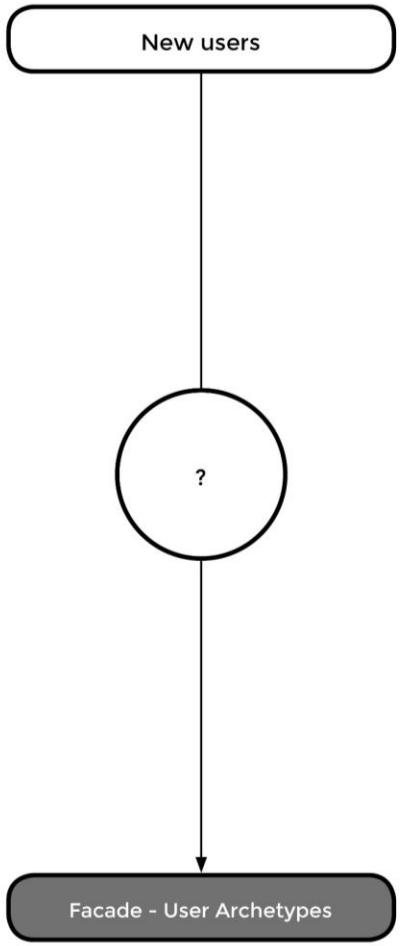
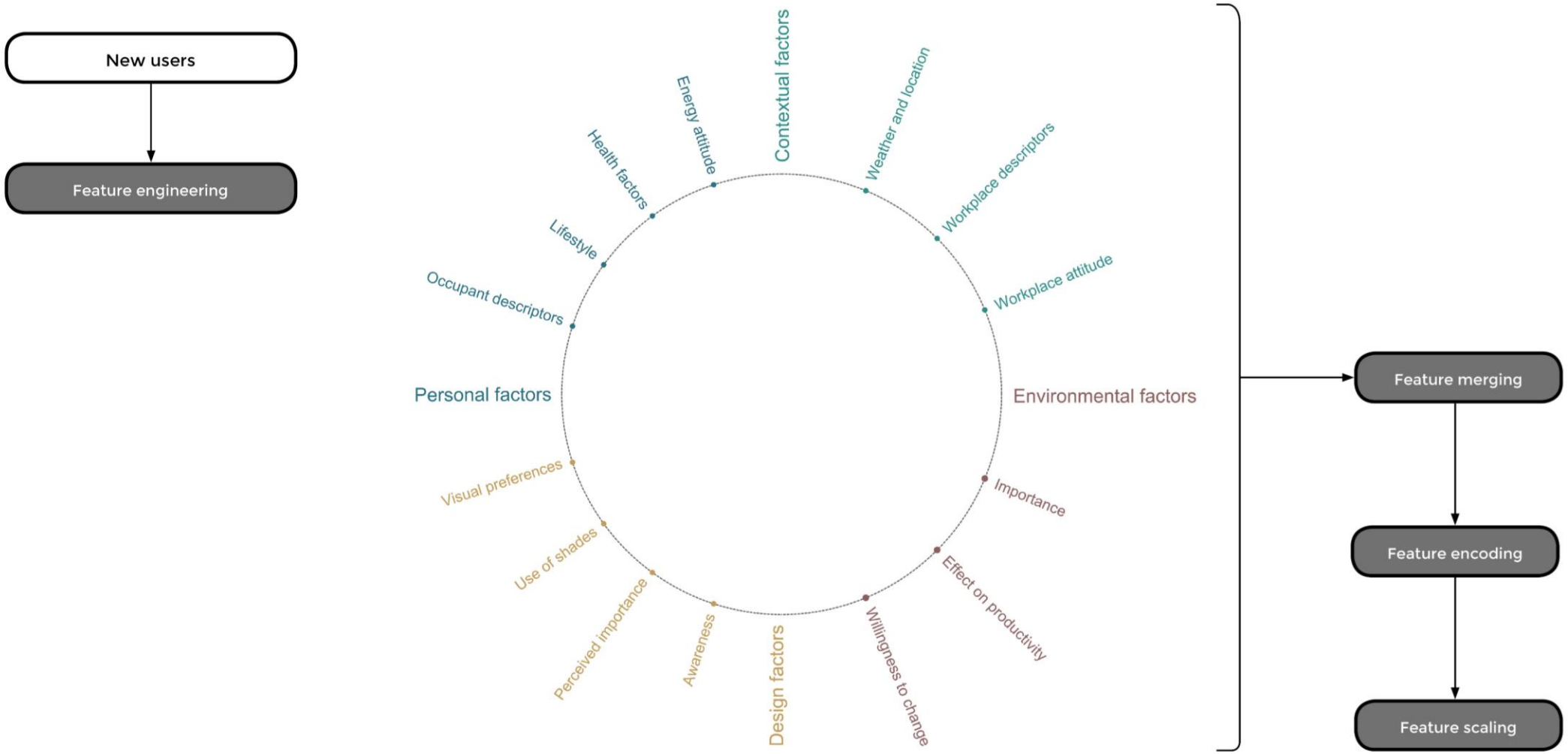
[06] Archetypes for new users

Workflow



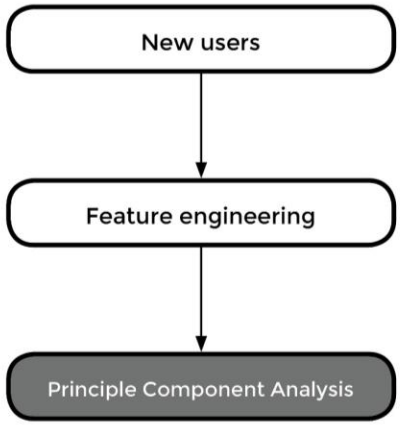
[06] Archetypes for new users

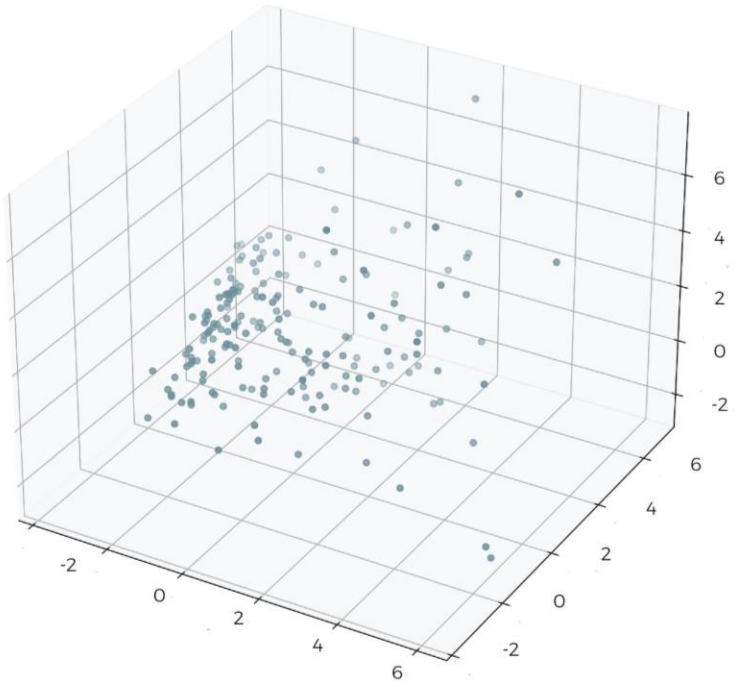
Workflow



[06] Archetypes for new users

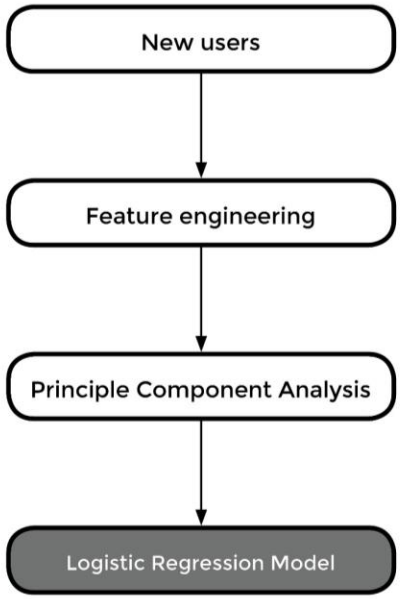
Workflow

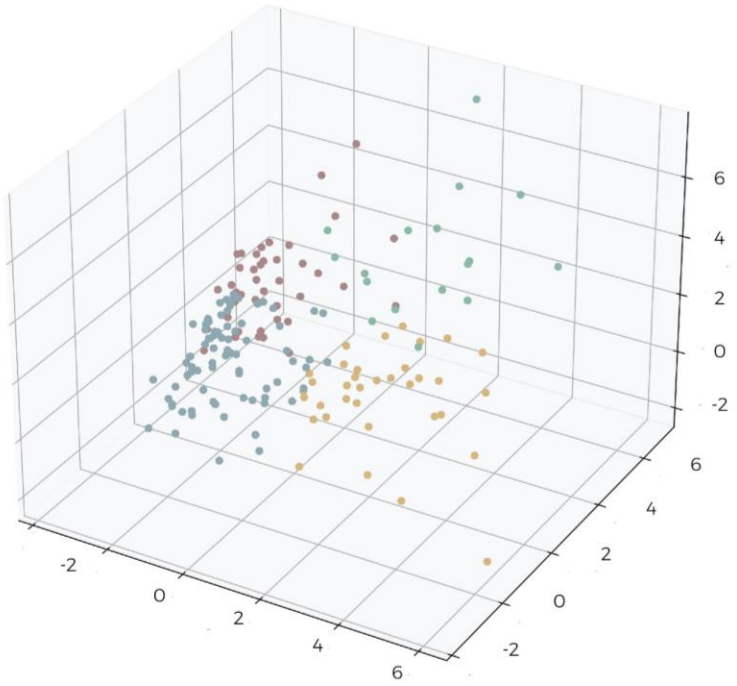




[06] Archetypes for new users

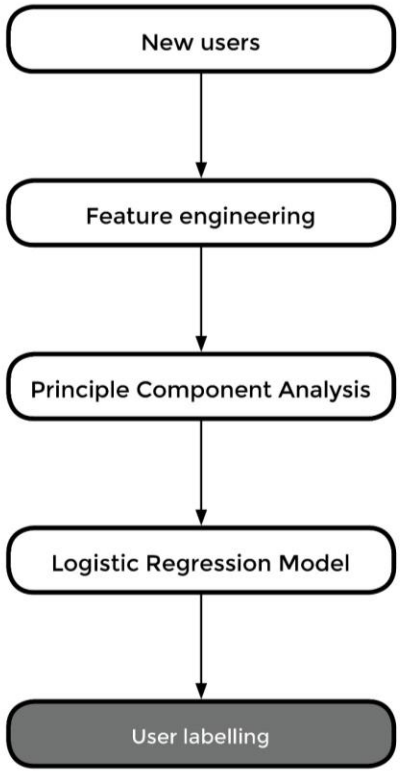
Workflow

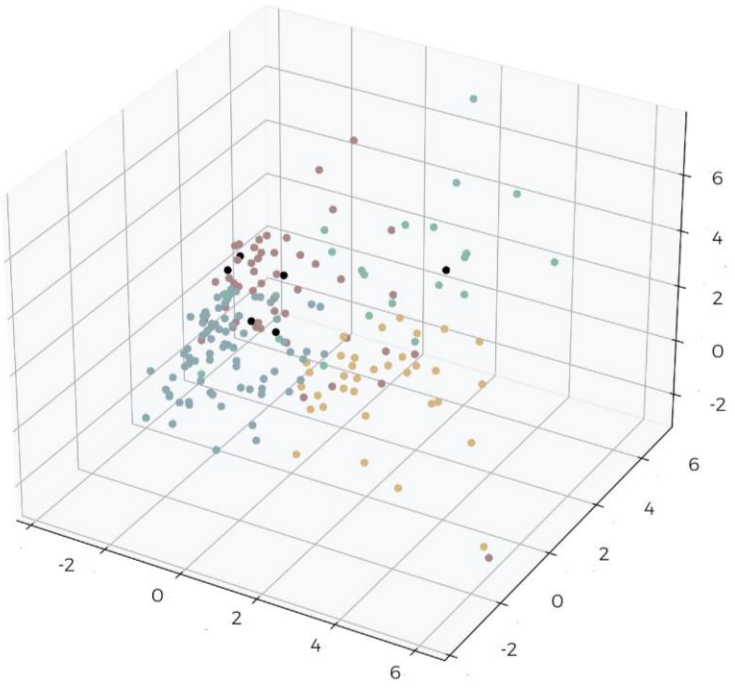




[06] Archetypes for new users

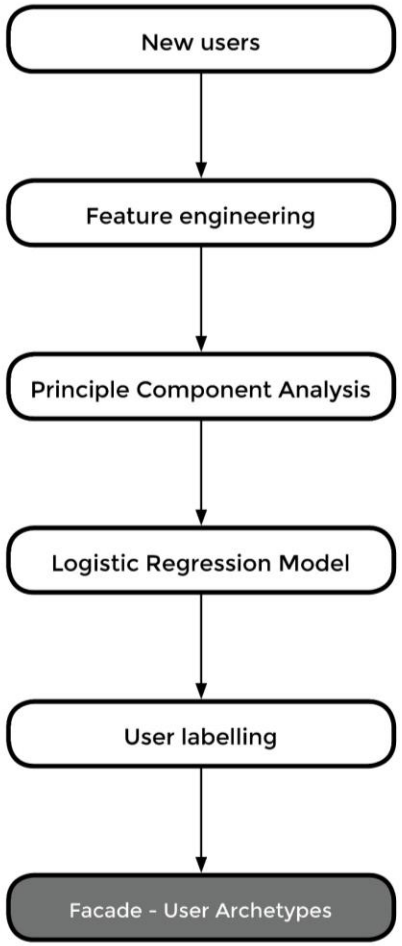
Workflow

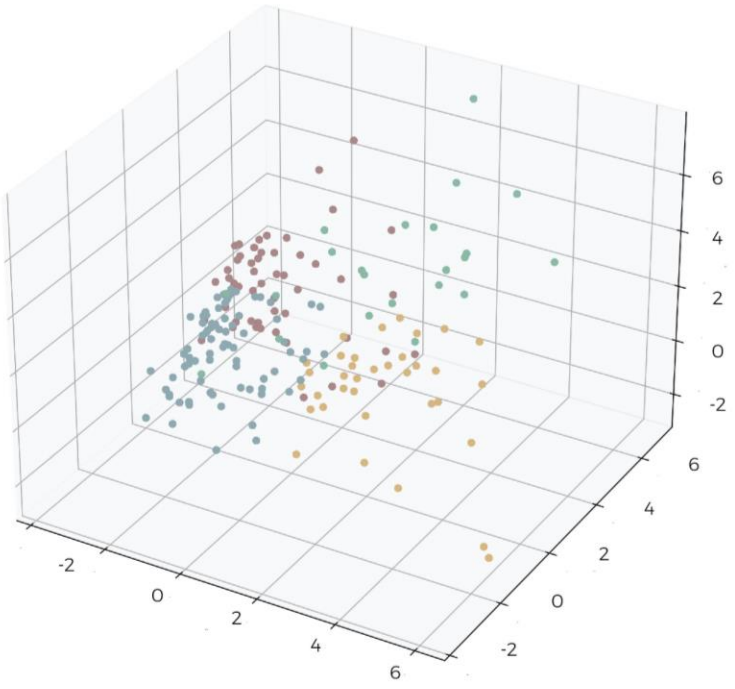


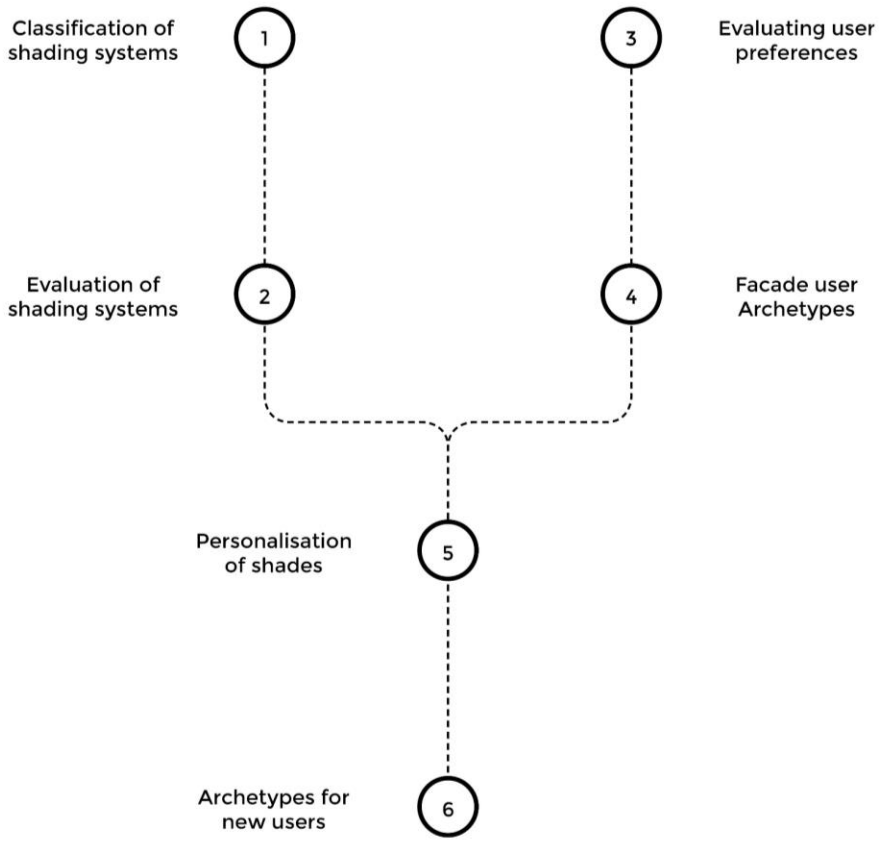


[06] Archetypes for new users

Workflow

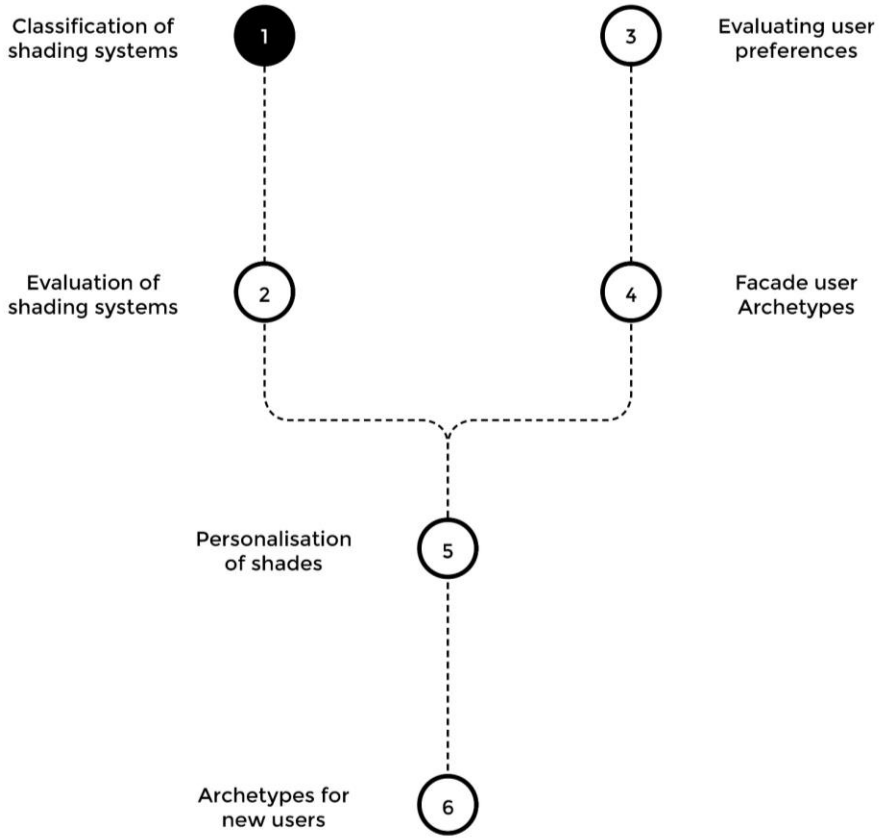


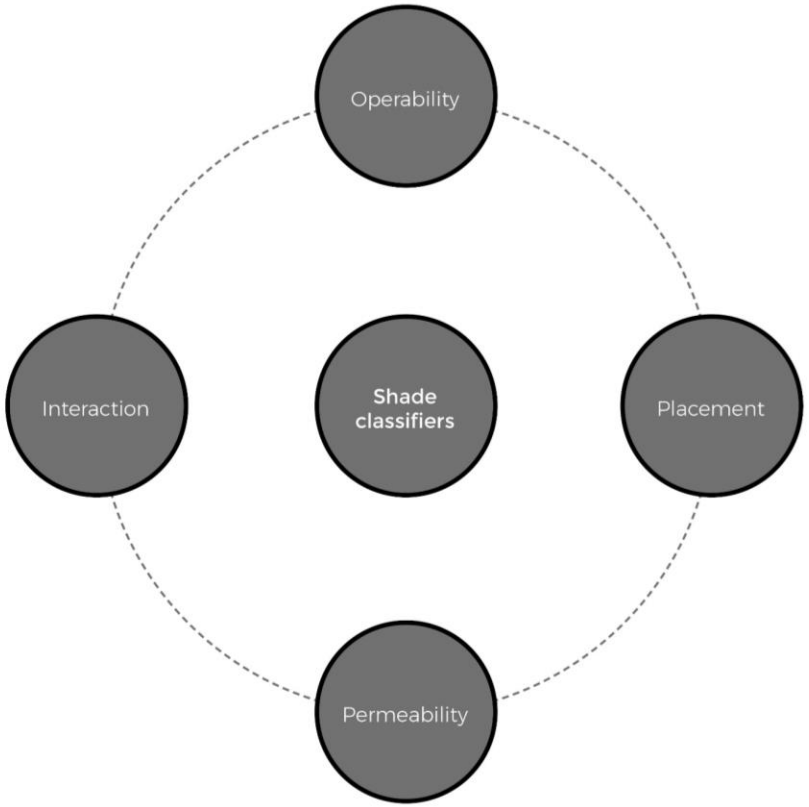




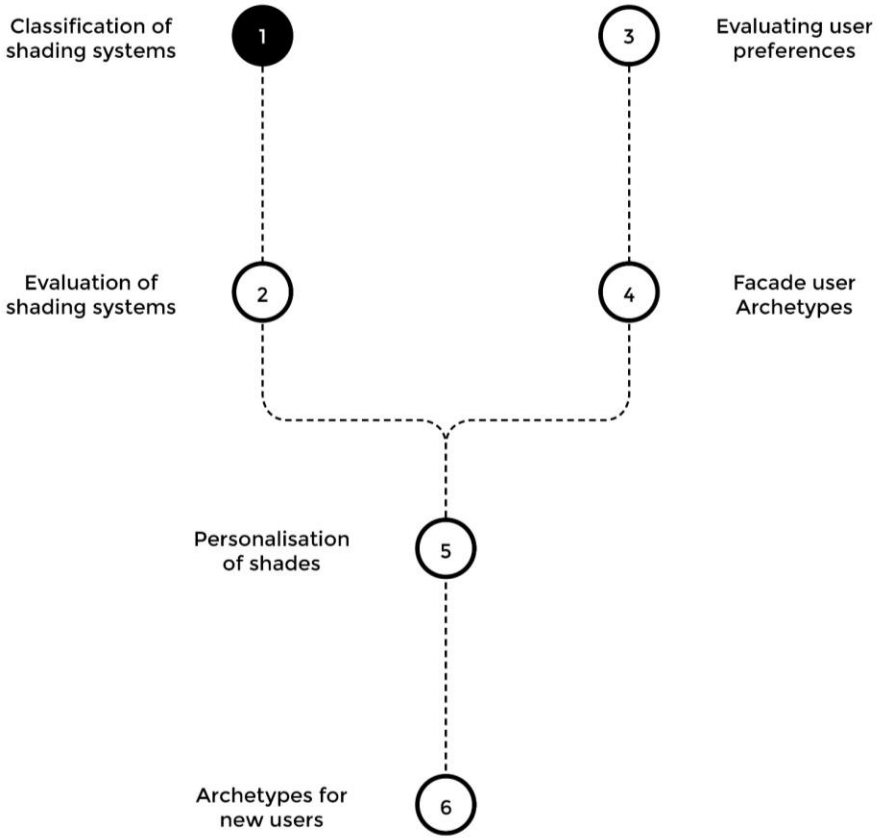
In conclusion

Conclusion


Classification of shading systems
1
3
Evaluating user preferences
Evaluation of shading systems
2
4
Facade user Archetypes
Personalisation of shades
5
Archetypes for new users
6


Operability
Interaction
Shade classifiers
Placement
Permeability

Conclusion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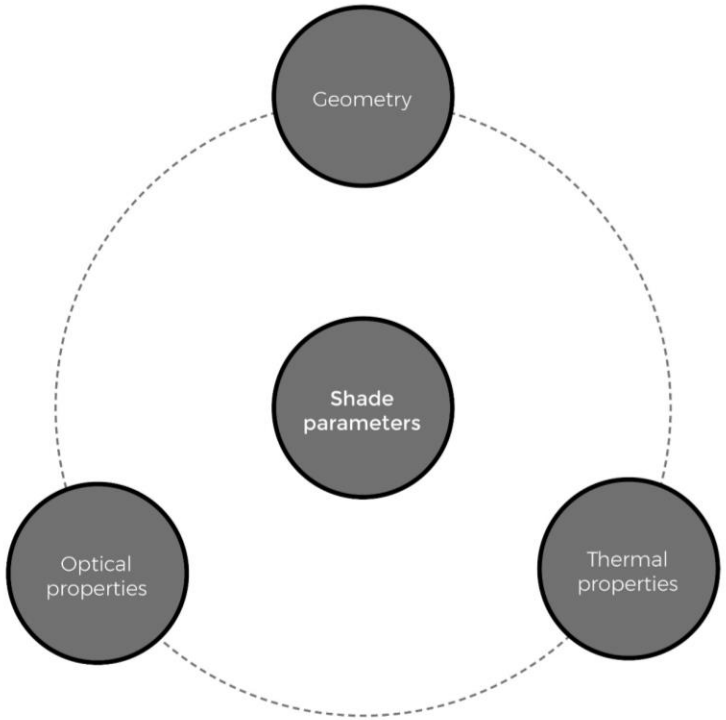
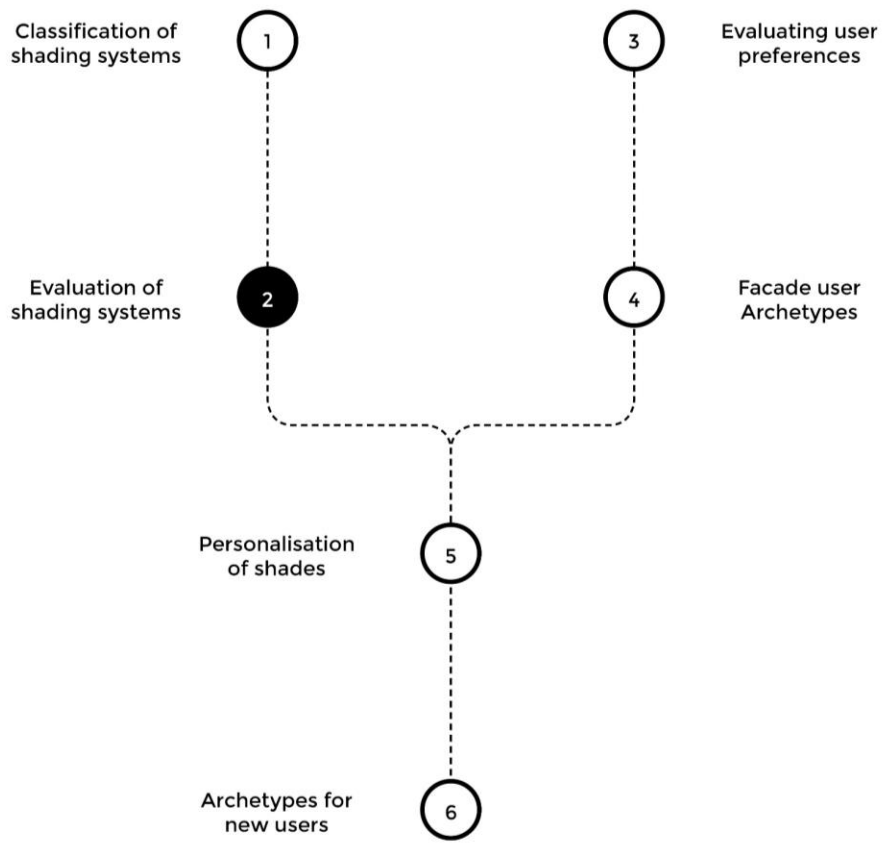

Geometry
Shade parameters
Optical properties
Thermal properties

Conclusion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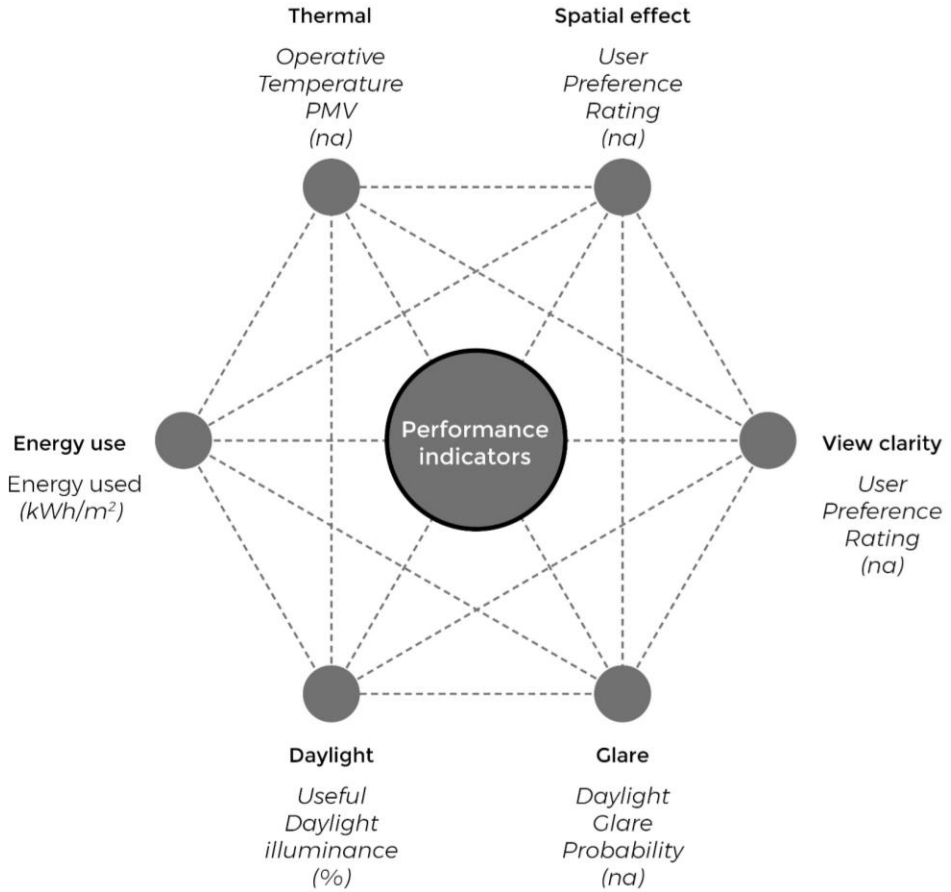
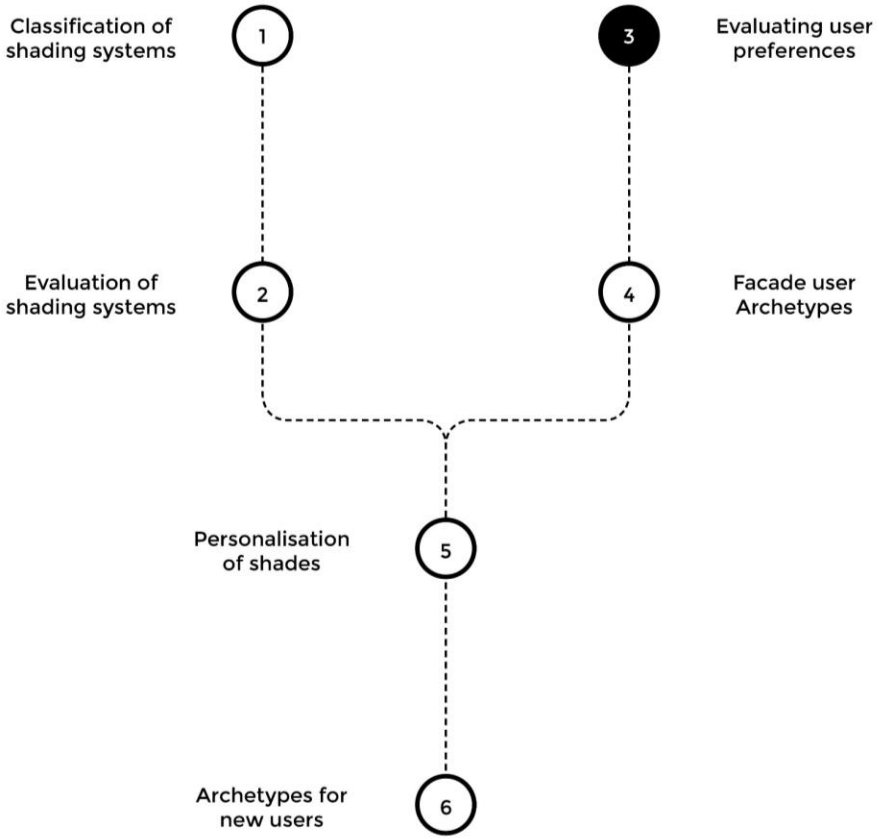

Thermal
Operative Temperature PMV (na)
Spatial effect
User Preference Rating (na)
Performance indicators
Energy use
Energy used (kWh/m²)
View clarity
User Preference Rating (na)
Daylight
Useful Daylight illuminance (%)
Glare
Daylight Glare Probability (na)

Conclusion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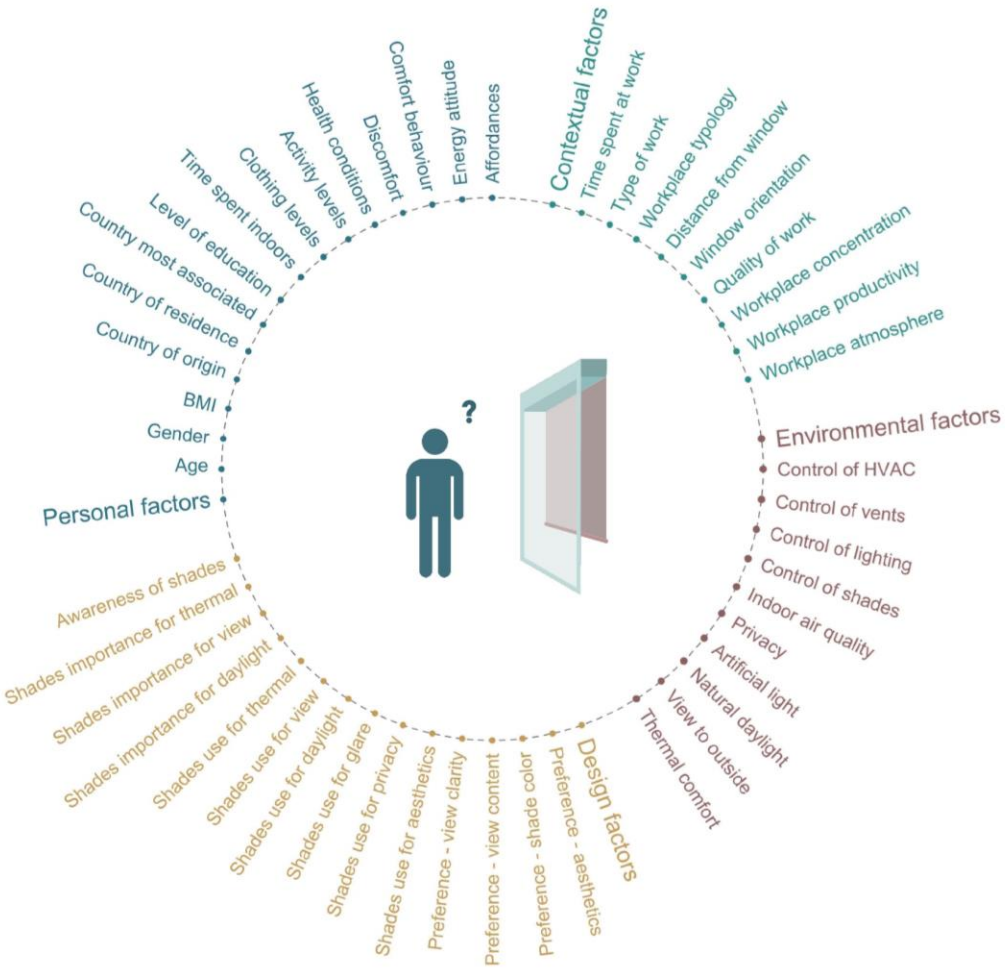
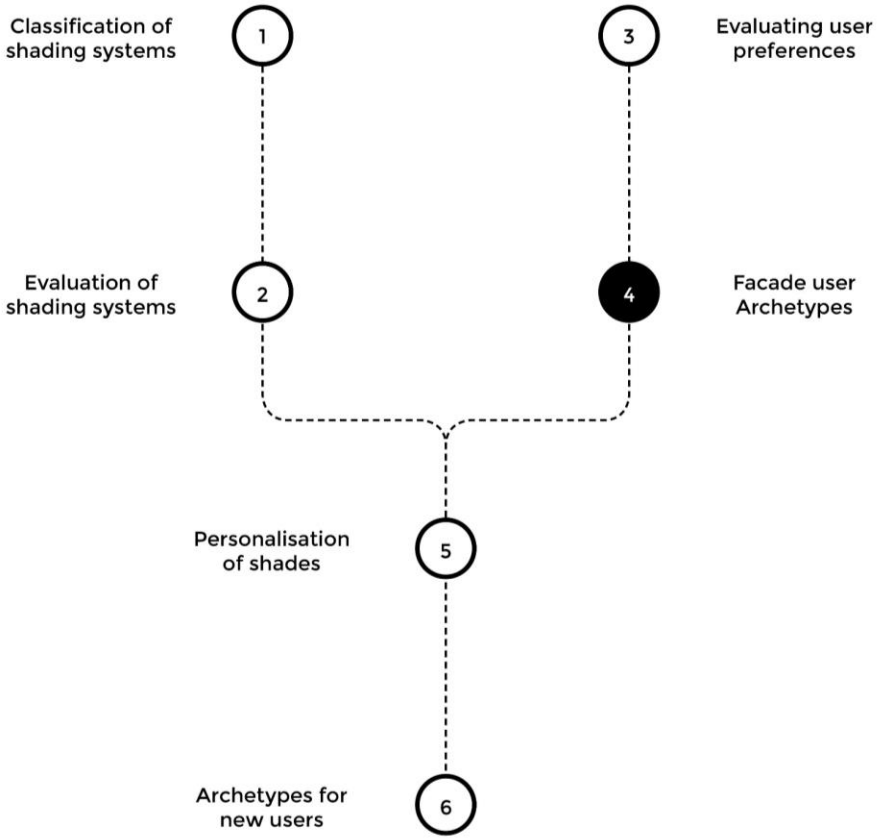

Contextual factors
Time spent at work
Type of work
Workplace typology
Distance from window
Window orientation
Quality of work
Workplace concentration
Workplace productivity
Workplace atmosphere
Environmental factors
Control of HVAC
Control of vents
Control of lighting
Control of shades
Indoor air quality
Privacy
Artificial light
Natural daylight
View to outside
Thermal comfort
Design factors
Preference - aesthetics
Preference - shade color
Preference - view content
Preference - view clarity
Shades use for aesthetics
Shades use for privacy
Shades use for glare
Shades use for daylight
Shades use for view
Shades use for thermal
Shades importance for daylight
Shades importance for view
Shades importance for thermal
Awareness of shades
Personal factors
Age
Gender
BMI
Country of origin
Country of residence
Country most associated
Level of education
Time spent indoors
Clothing levels
Activity levels
Health conditions
Discomfort
Comfort behaviour
Energy attitude
Affordances
?

Conclusion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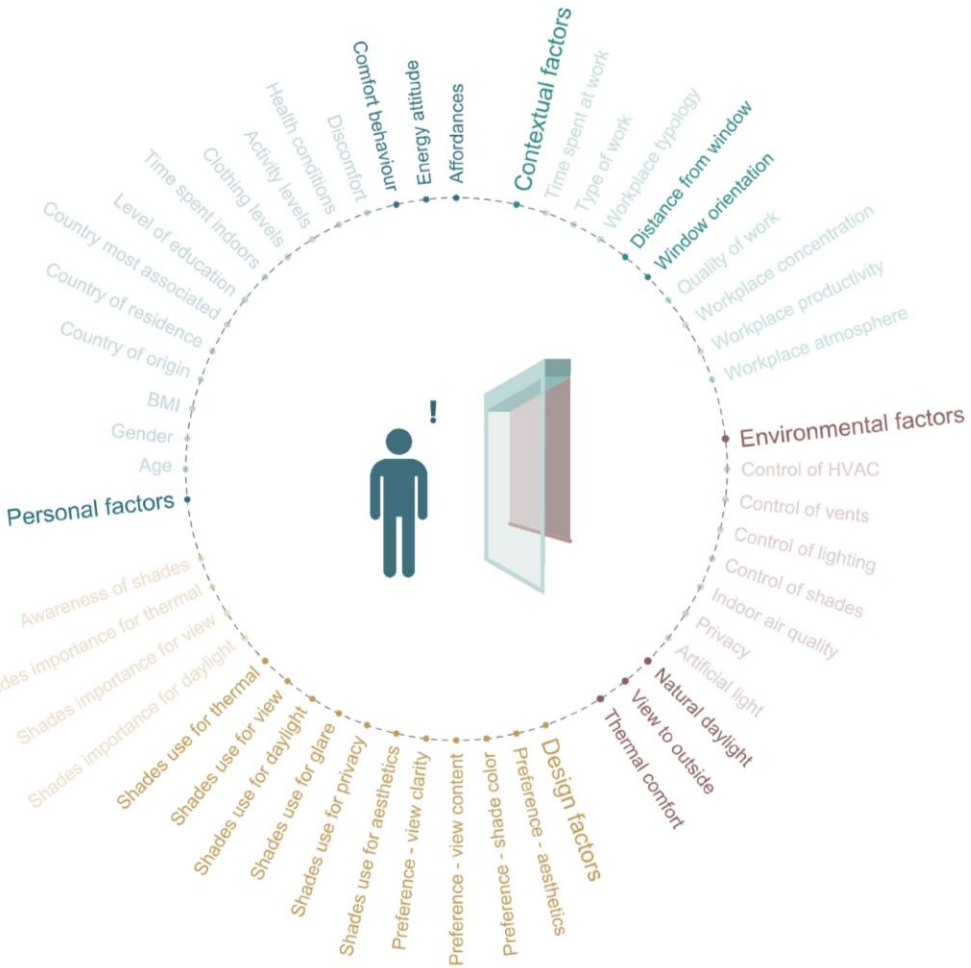
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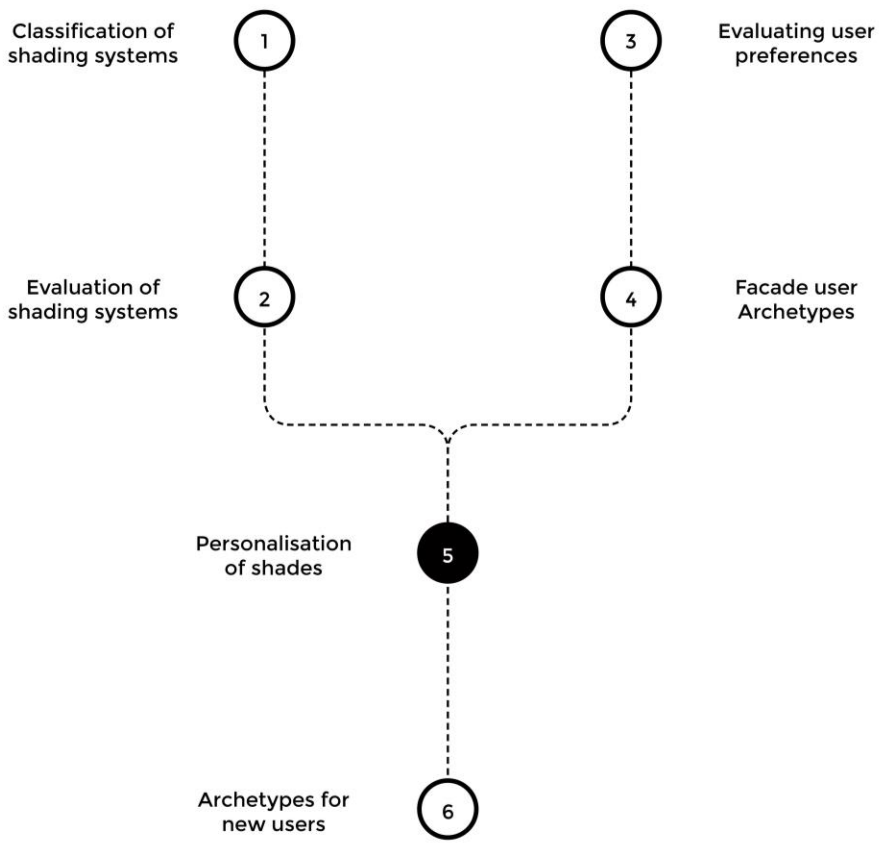
Conclusion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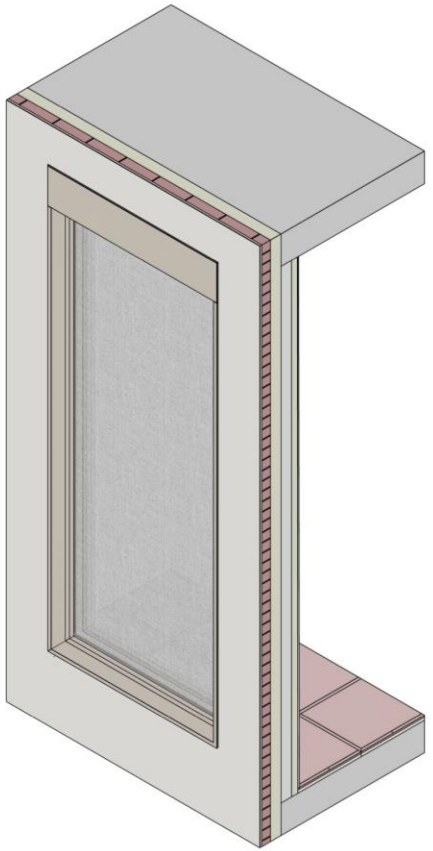
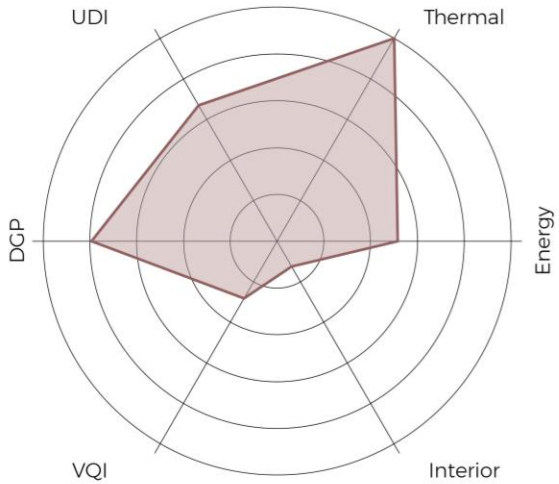
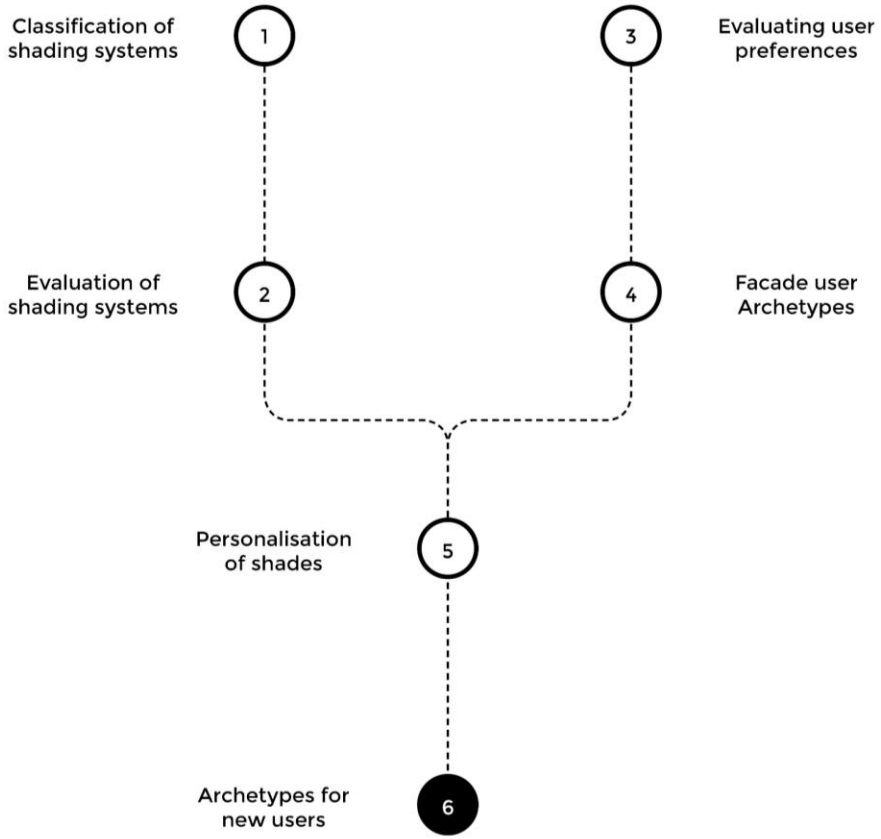



UDI
Thermal
DGP
Energy
VQI
Interior

Conclusion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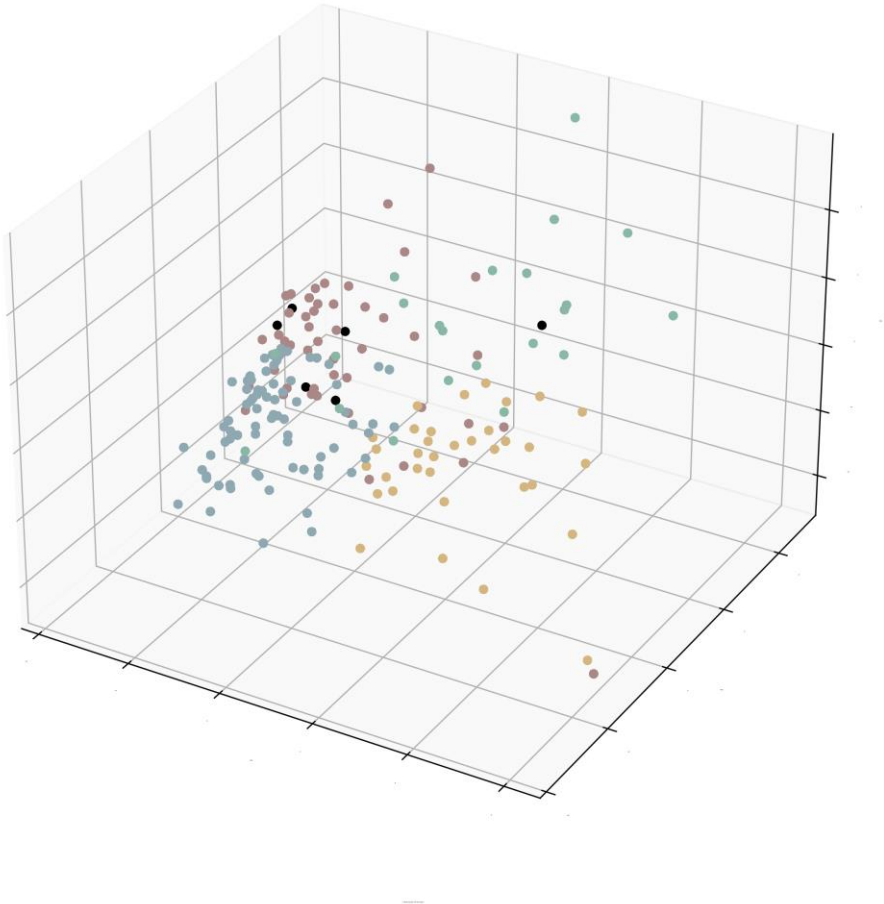
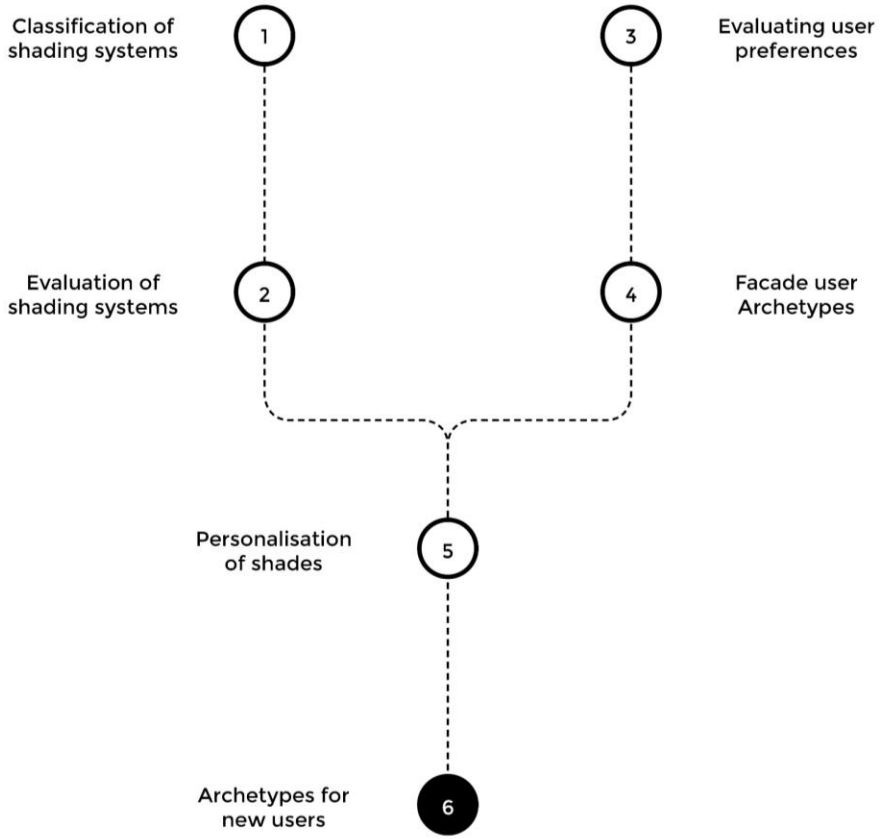


Conclusion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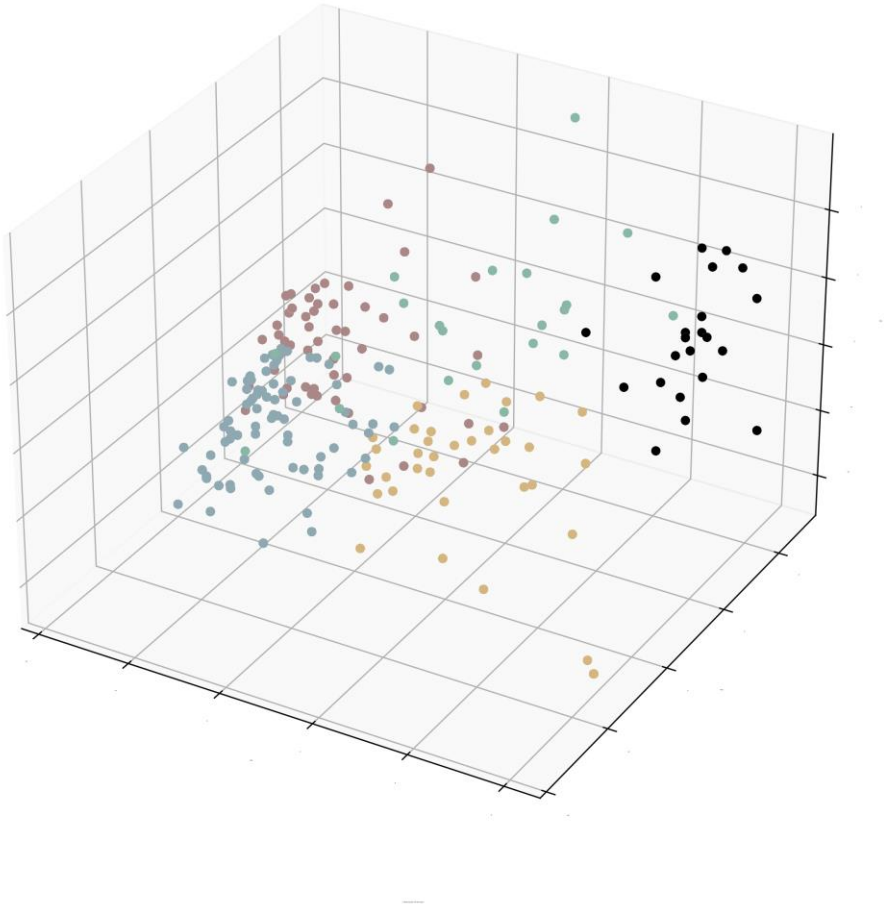
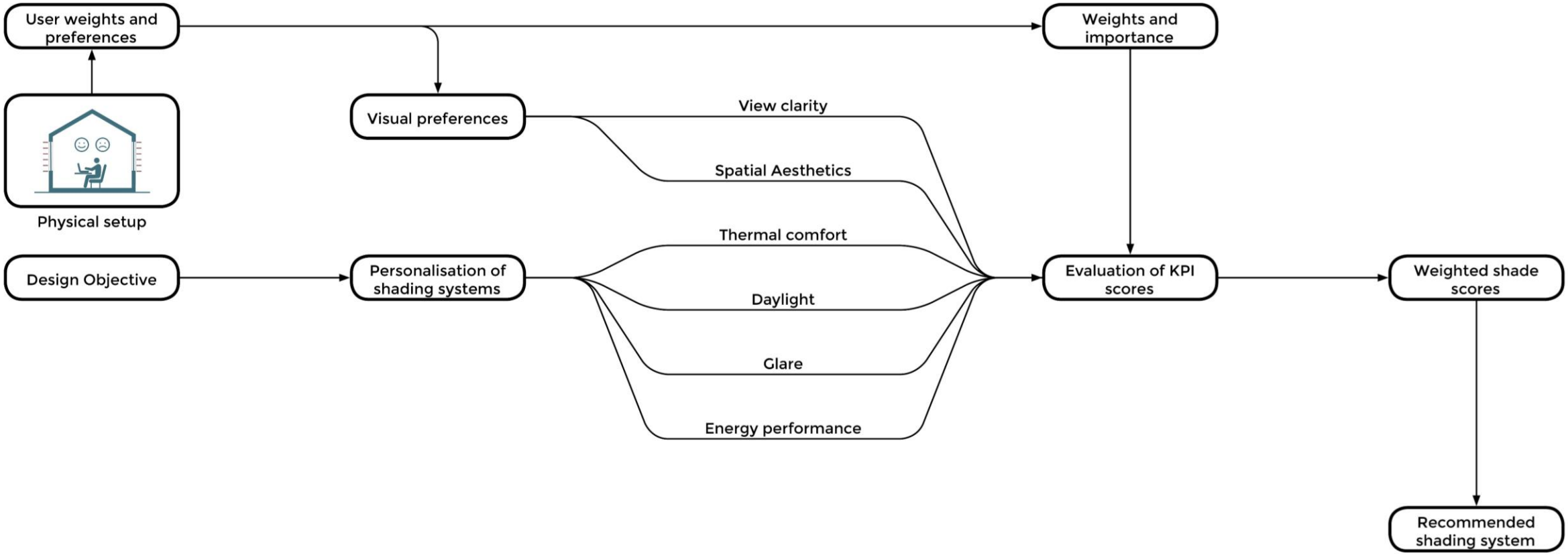


Limitations and recommendations



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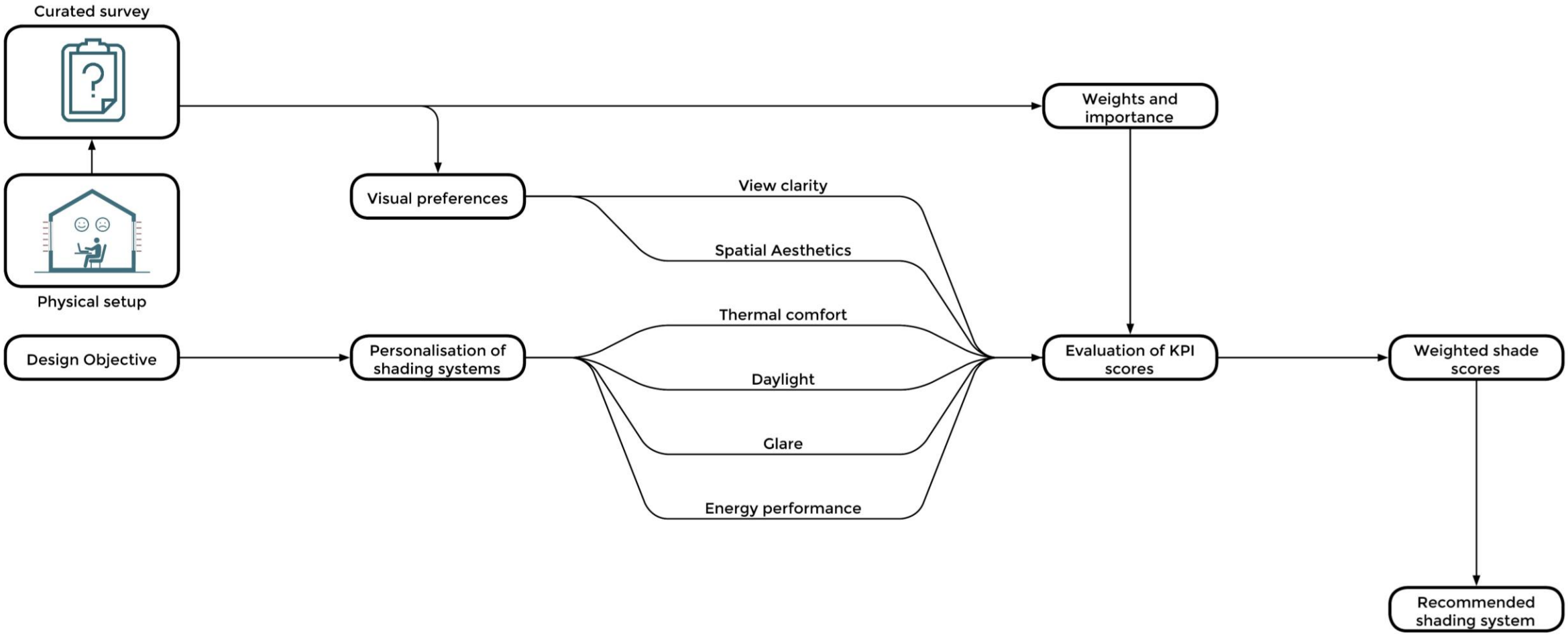

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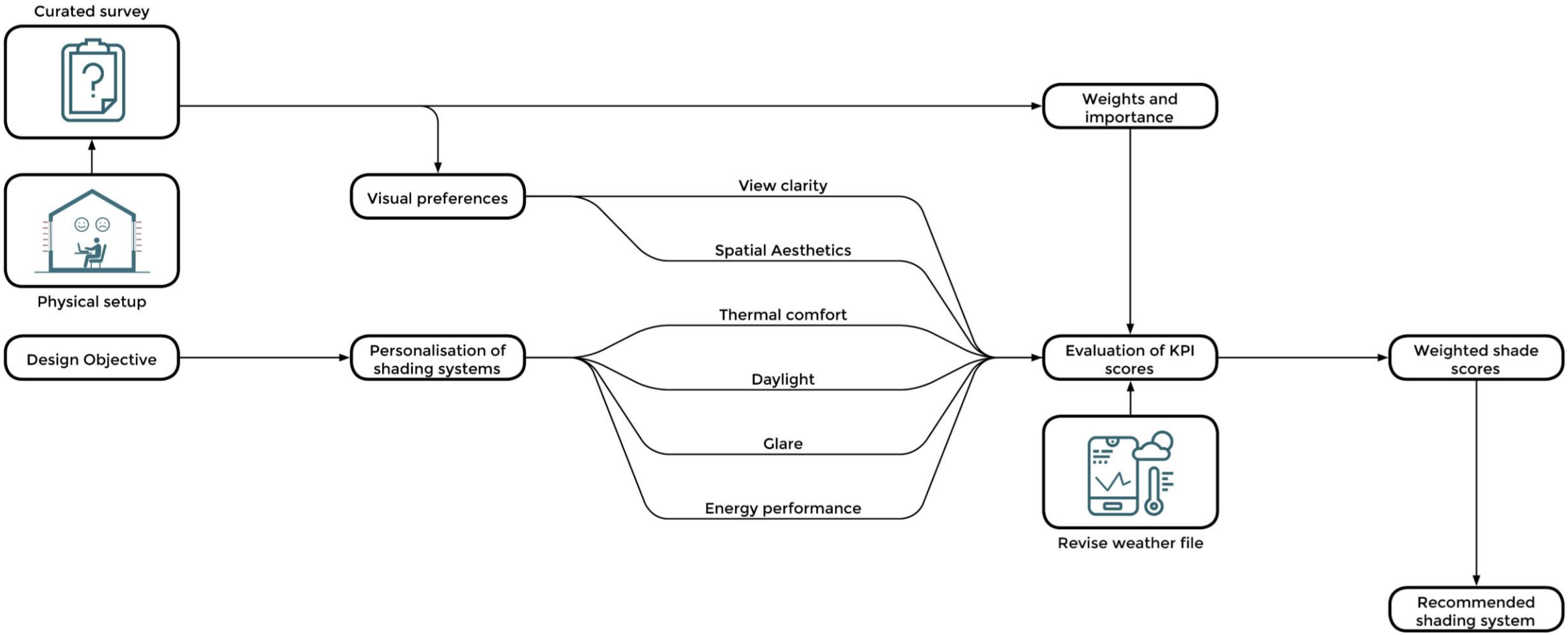

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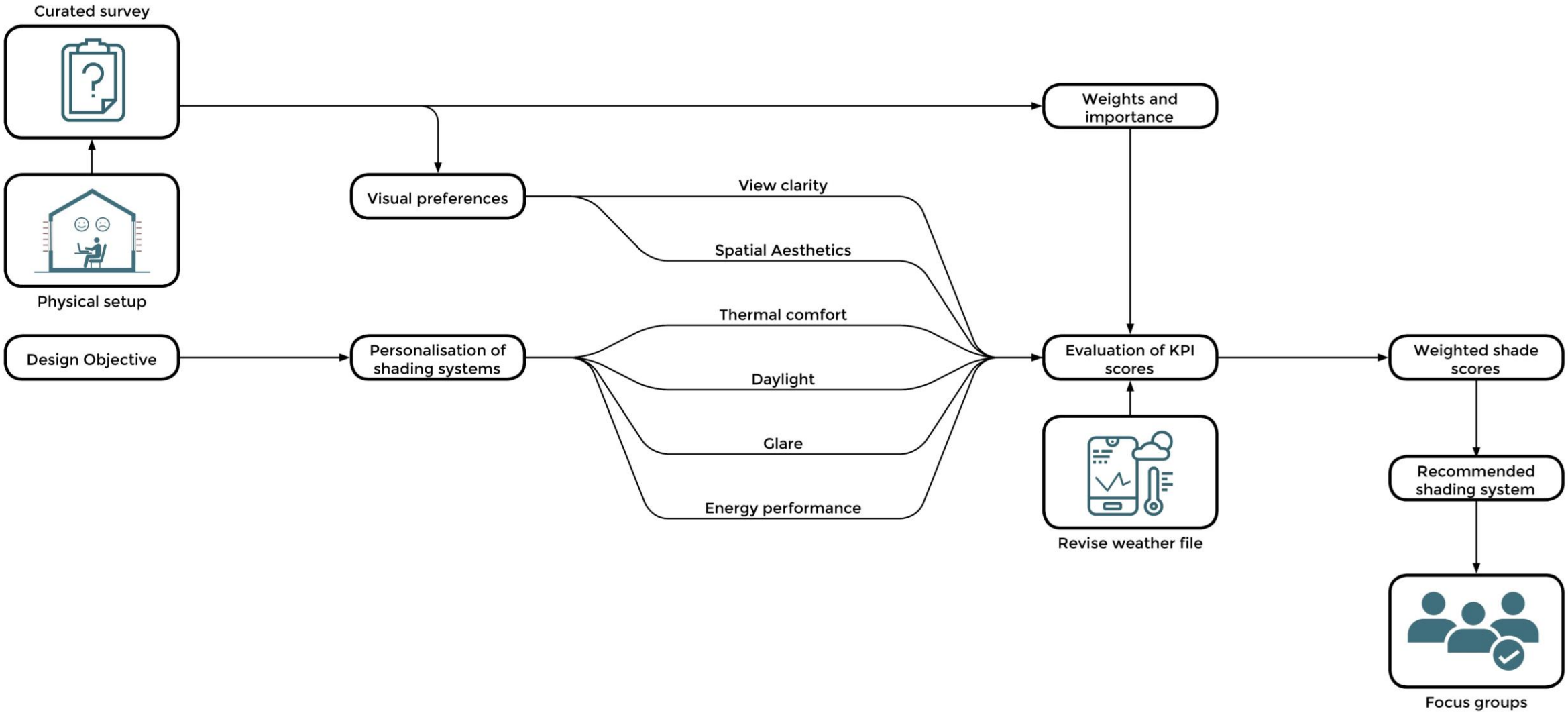


The Future of Archetypes in Design

Building envelope design

Market analysis

Building system control

Thank you

[A] References

- *Crone Architects. "Crone Office - 680 George Street." ArchDaily. https://www.archdaily.com/998494/crone-office-680-george-street-crone-architects?ad_source=search&ad_medium=projects_tab*

- *Schweizer, C., Edwards, R. D., Bayer-Oglesby, L., Gauderman, W. J., Ilacqua, V., Juhani Jantunen, M., ... & Künzli, N. (2007). Indoor time–microenvironment–activity patterns in seven regions of Europe. Journal of exposure science & environmental epidemiology, 17(2), 170-181.*

- *Bluyssen, P. M. (2009). The Indoor Environment Handbook: How to Make Buildings Healthy and Comfortable: Earthscan.*

- *IEA. 2019. World Electricity Final Consumption by Sector, 1974-2019. IEA, Paris. License: CC BY 4.0. https://www.iea.org/data-and-statistics/charts/world-electricity-final-consumption- by-sector-1974 2019.*

- *Knaack, Ulrich, Tillmann Klein, Marcel Bilow, and Thomas Auer. 2014. Façades: principles of construction. Birkhäuser*

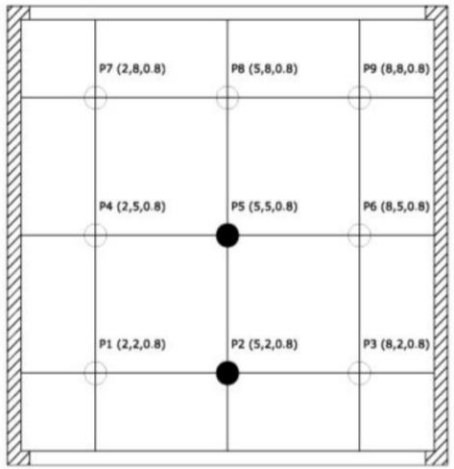
- *Herzog, Thomas, Roland Krippner, and Werner Lang. 2012. Facade construction manual. Walter de Gruyter*

- *Norman, Donald A. 1988. The psychology of everyday things. Basic books.*

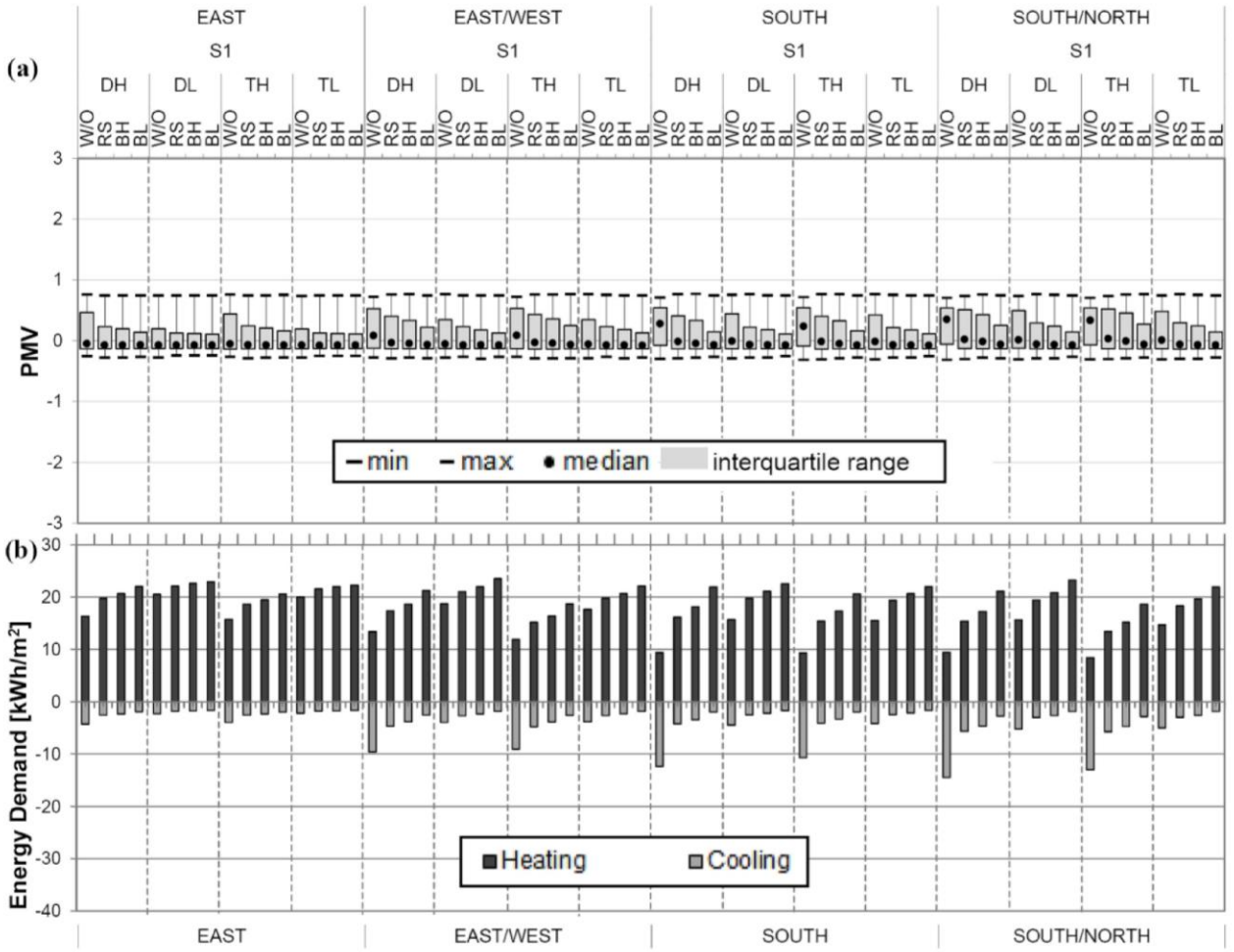
- *Ortiz, Marco A, and Philomena M Bluyssen. 2019. "Developing home occupant archetypes: First results of mixed-methods study to understand occupant comfort behaviours and energy use in homes." Building and Environment 163:106331*

[B] Annex

Shading Technologies

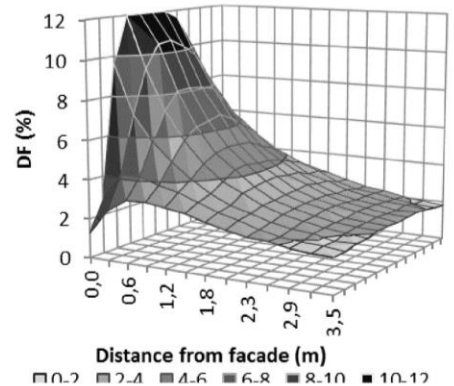


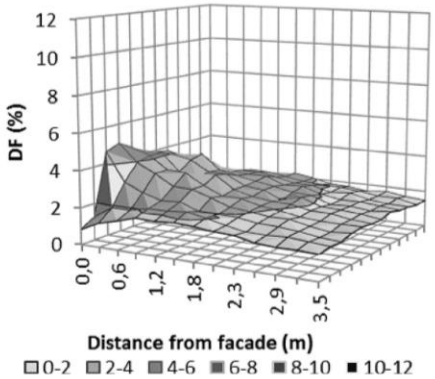
External shadings	WITHOUT SHADES (WO): - ROLLER SHADE (RS): Roller Shade; ρ_s = 0.5; τ_s = 0.4 BLIND-H (BH): Venetian Blind with high reflectivity slats; ρ_s = 0.8 BLIND-L (BL): Venetian Blind with low reflectivity slats; ρ_s = 0.2

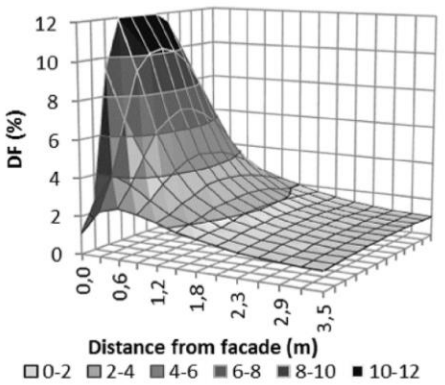


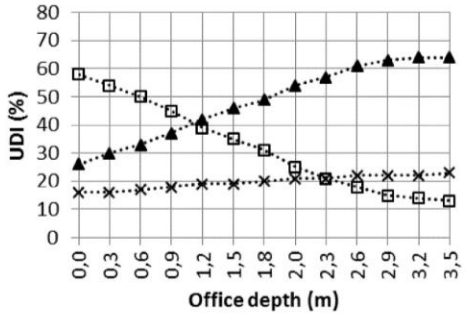
[B] Annex

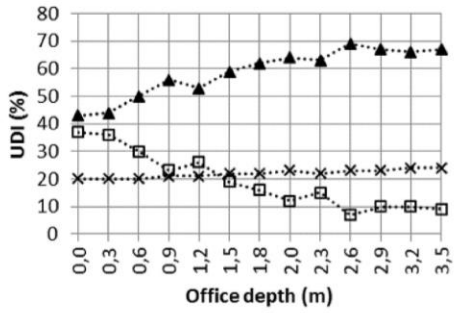
Shading Technologies

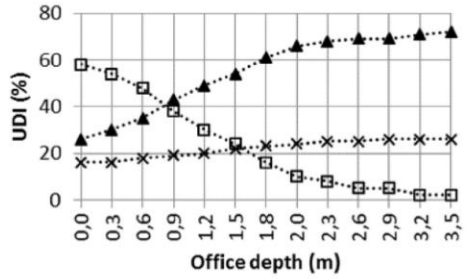






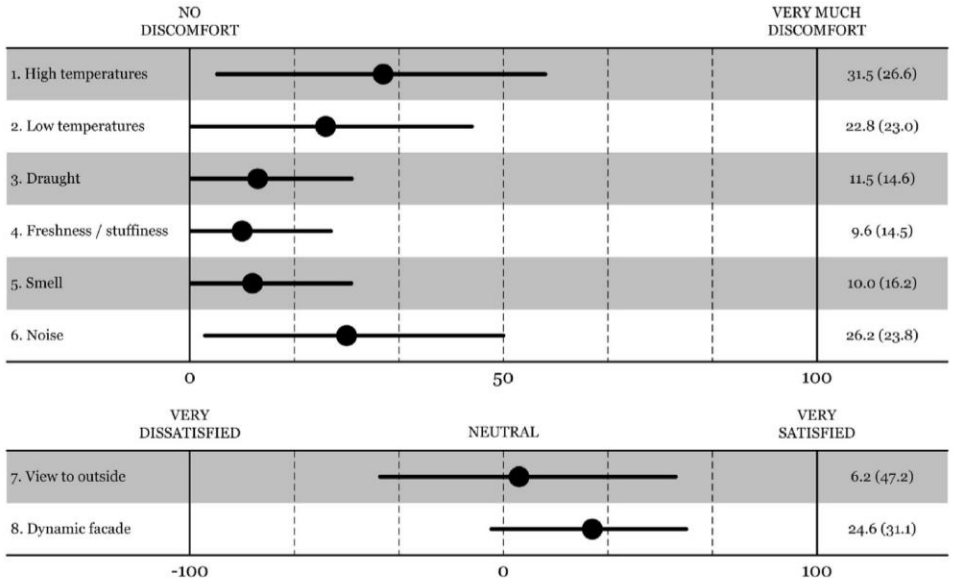


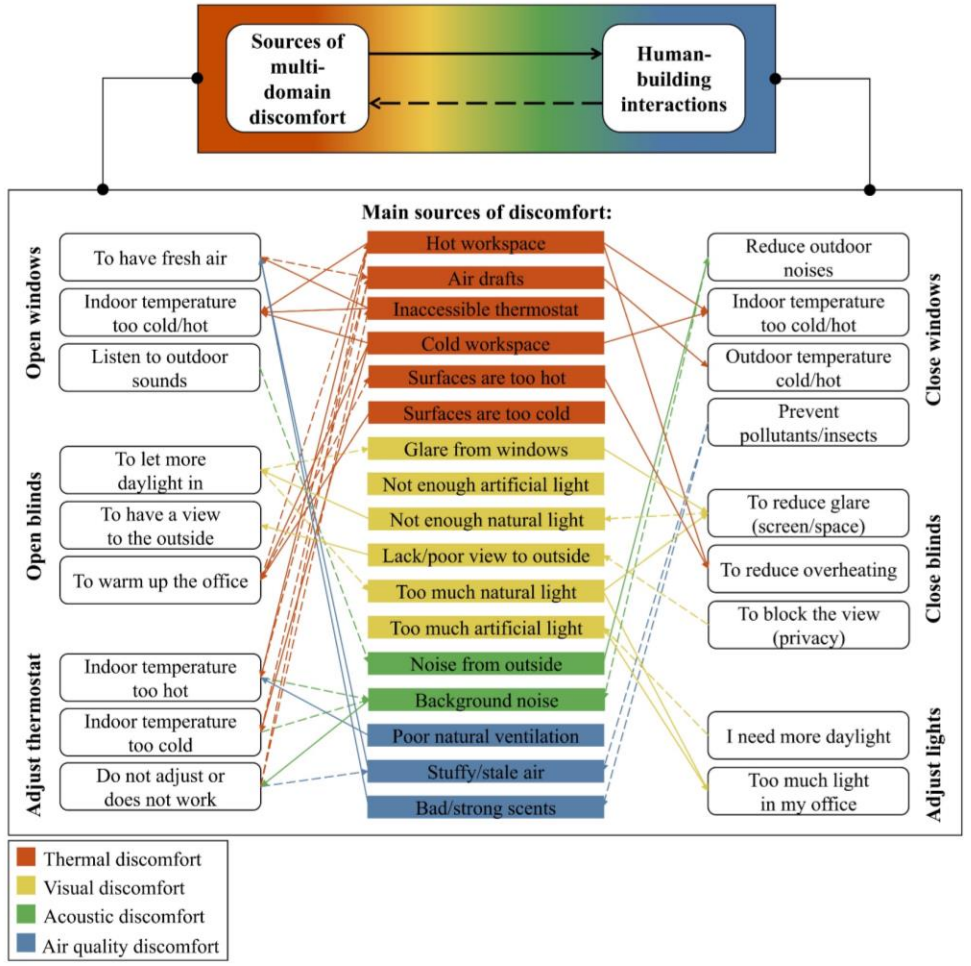




[B] Annex

Shading Technologies





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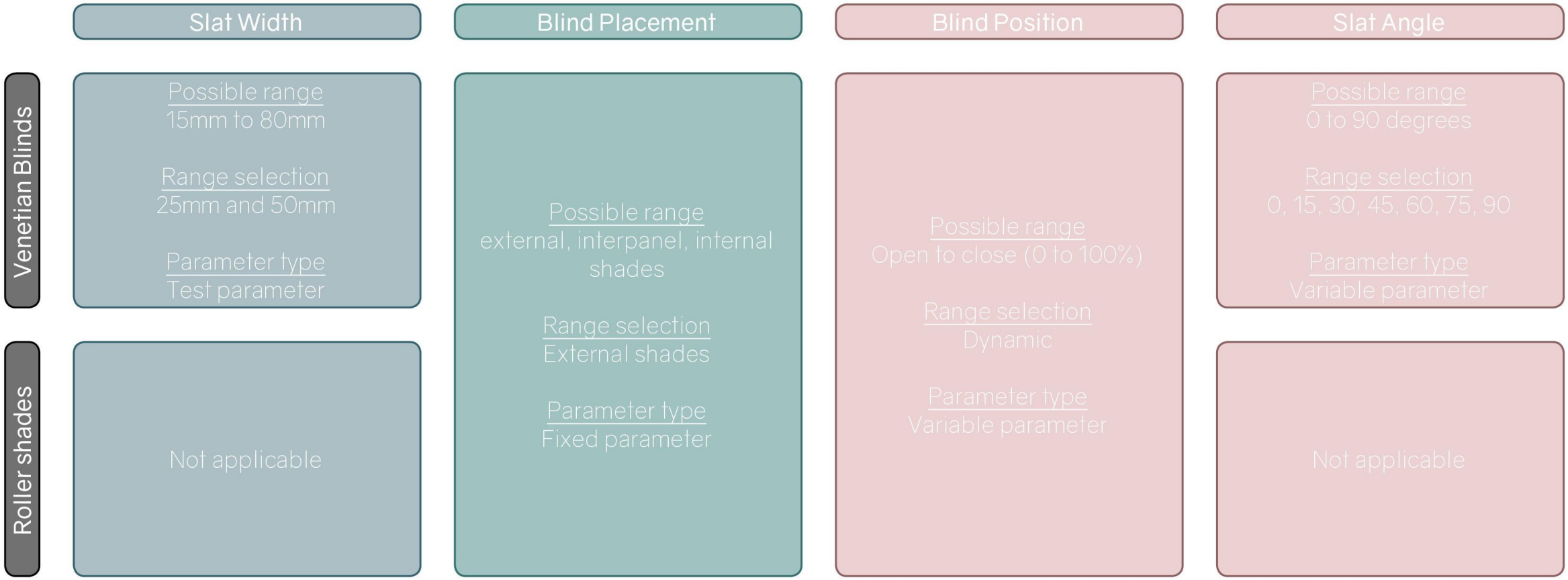
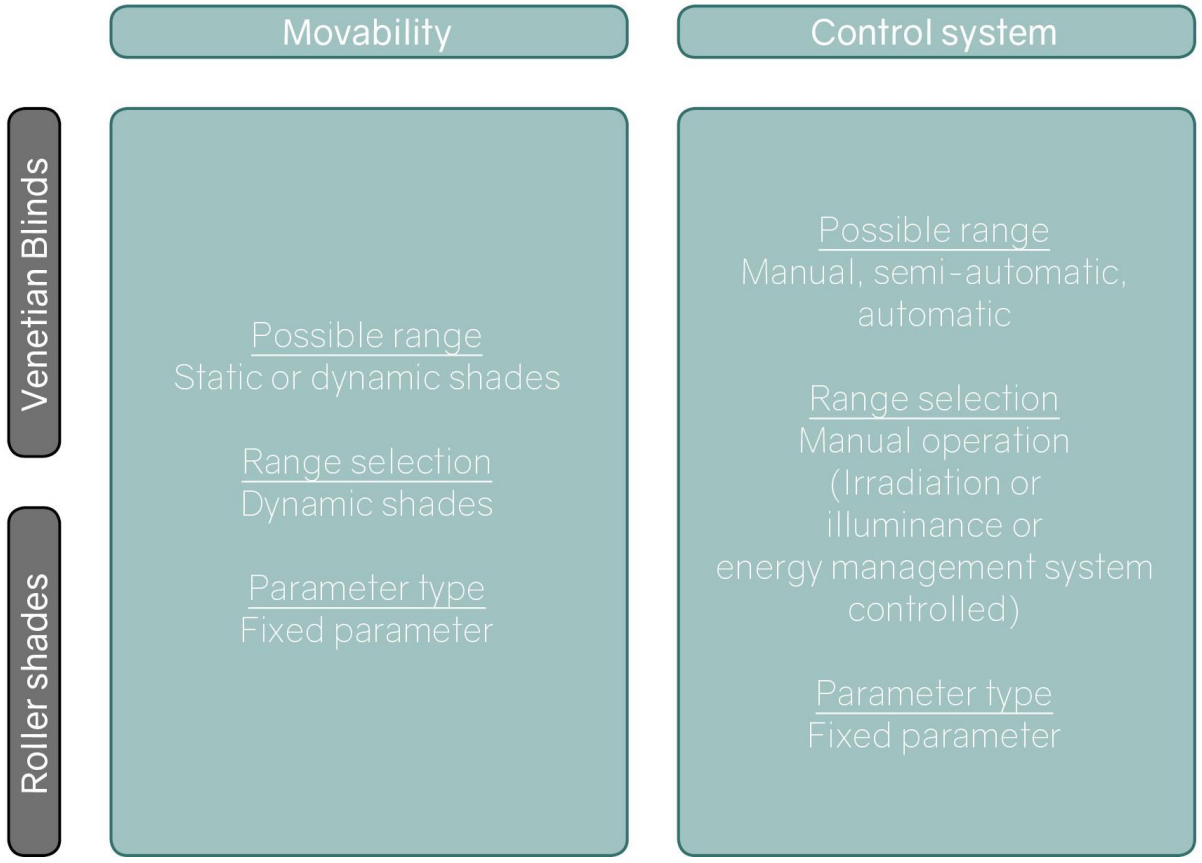
Shading Technologies



[B] Annex

Shading Technologies



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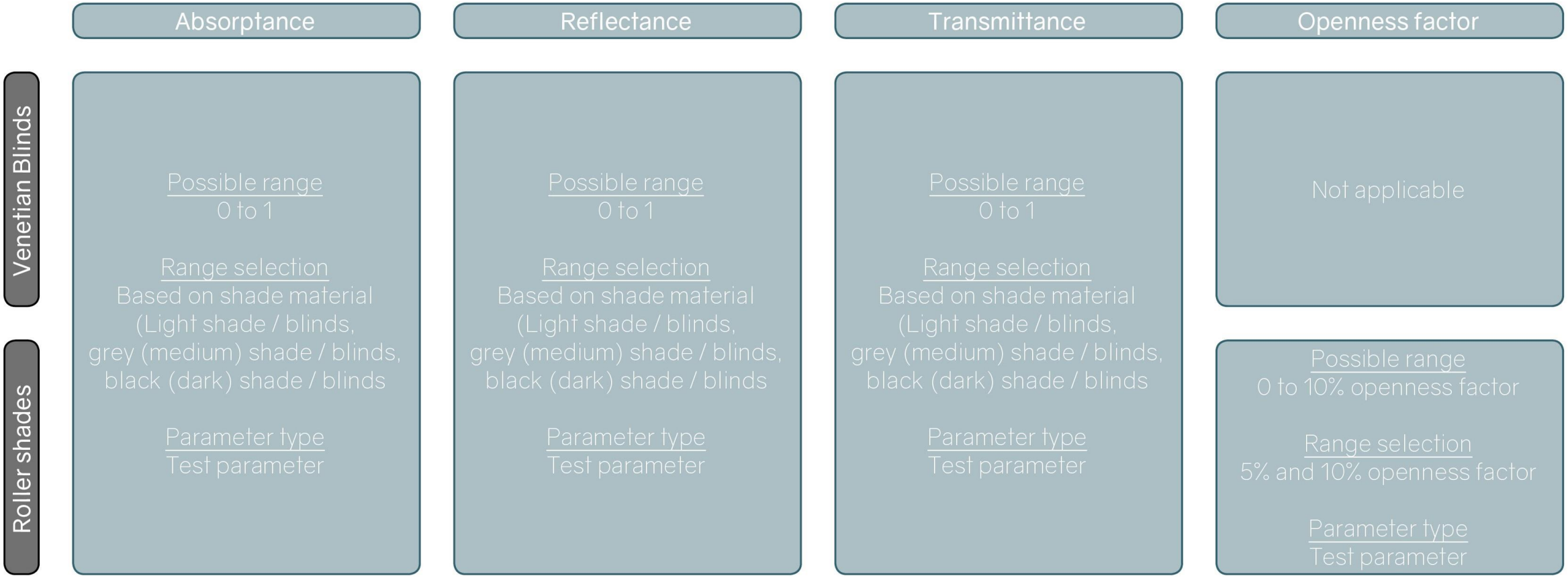


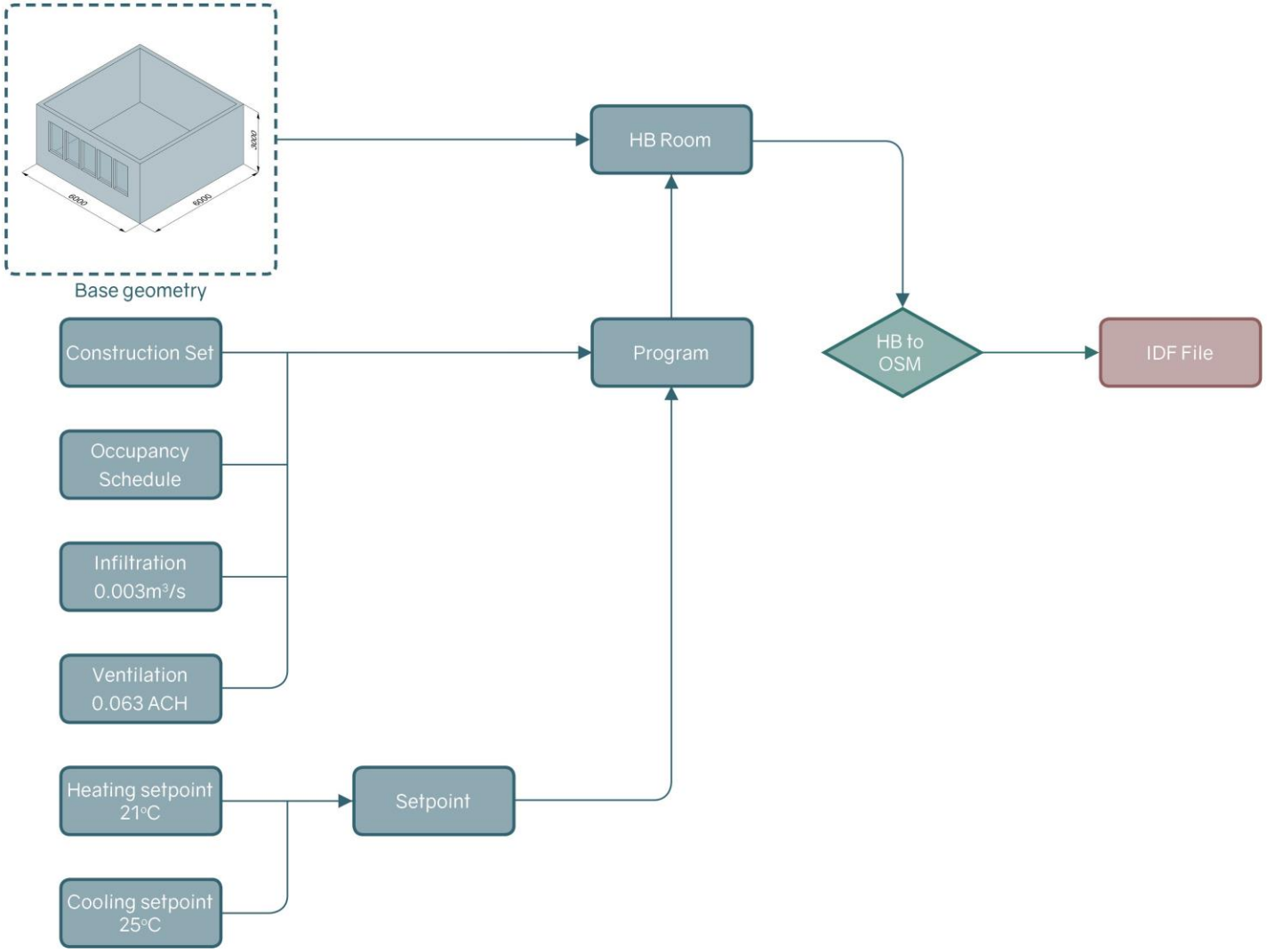
[B] Annex

Shading Technologies

	Shade type	Permeability	RGB		A		R		T	
		OF / slat size	Color	Color specification	Solar	Optic	Solar	Optic	Solar	Optic
Roller Shades	Type 1 (RB_05_L)	5 % openness factor	White	(0.94902 , 0.94902, 0.9294)	0.20	0.18	0.55	0.60	0.25	0.22
	Type 2 (RB_05_M)	5 % openness factor	Grey	(0.52941, 0.52157, 0.50588)	0.61	0.63	0.28	0.28	0.11	0.09
	Type 3 (RB_05_D)	5 % openness factor	Black	(0.05490, 0.05490, 0.06275)	0.89	0.9	0.06	0.06	0.05	0.04
	Type 4 (RB_10_L)	10% openness factor	White	(0.94902 , 0.94902, 0.9294)	0.20	0.18	0.55	0.60	0.25	0.22
	Type 5 (RB_10_M)	10% openness factor	Grey	(0.52941, 0.52157, 0.50588)	0.61	0.63	0.28	0.28	0.11	0.09
	Type 6 (RB_10_L)	10% openness factor	Black	(0.05490, 0.05490, 0.06275)	0.89	0.9	0.06	0.06	0.05	0.04
Venetian Blinds	Type 7 (VB_25_L)	25mm slat width	White	(0.94902 , 0.94902, 0.9294)	0.25	0.16	0.75	0.84	0	0
	Type 8 (VB_25_M)	25mm slat width	Grey	(0.52941, 0.52157, 0.50588)	0.65	0.71	0.35	0.29	0	0
	Type 9 (VB_25_D)	25mm slat width	Black	(0.05490, 0.05490, 0.06275)	0.96	0.95	0.04	0.05	0	0
	Type 10 (VB_50_L)	50mm slat width	White	(0.94902 , 0.94902, 0.9294)	0.25	0.16	0.75	0.84	0	0
	Type 11 (VB_50_M)	50mm slat width	Grey	(0.52941, 0.52157, 0.50588)	0.65	0.71	0.35	0.29	0	0
	Type 12 (VB_50_D)	50mm slat width	Black	(0.05490, 0.05490, 0.06275)	0.96	0.95	0.04	0.05	0	0

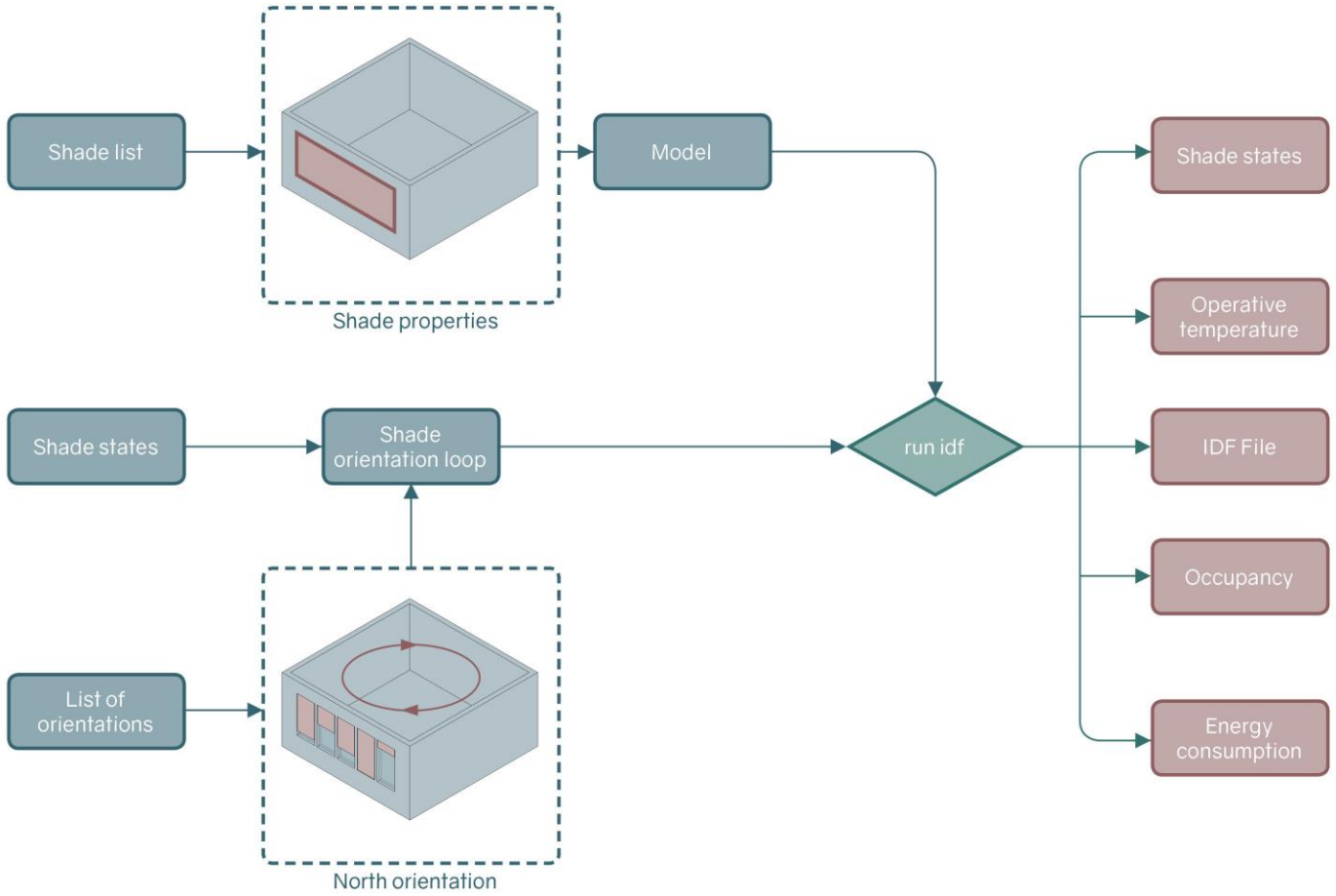
[03] Shade Evaluation

Base model



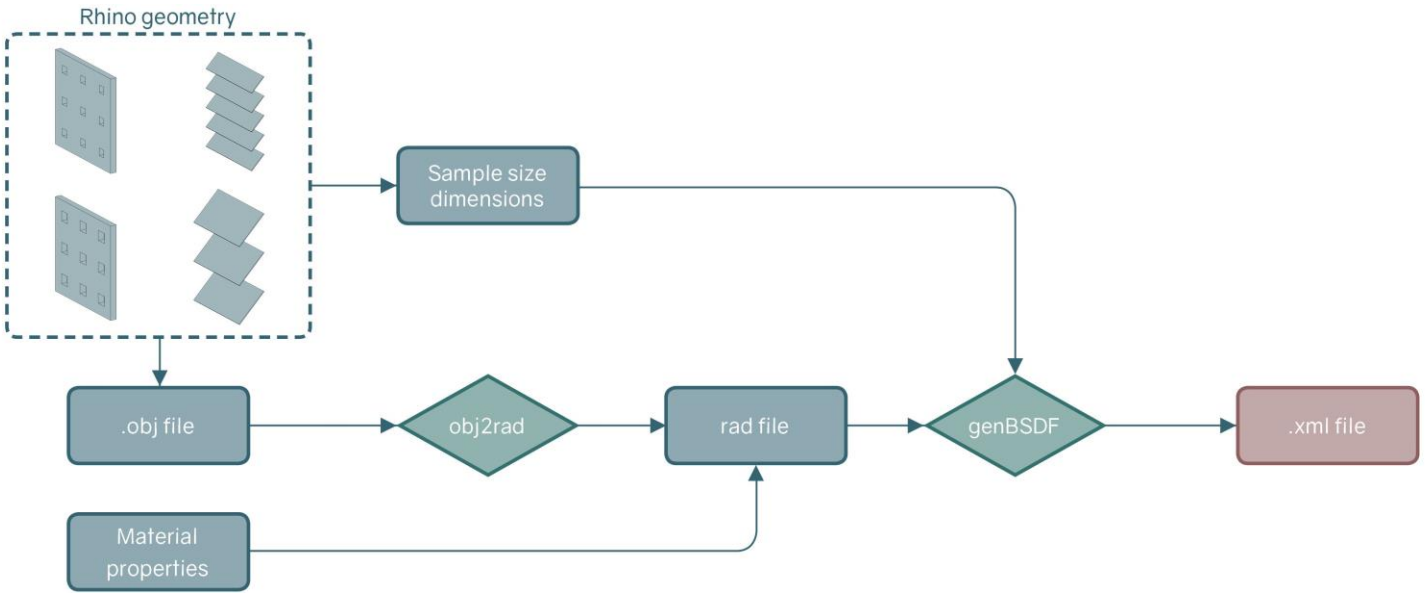
[03] Shade Evaluation

Energyplus workflow



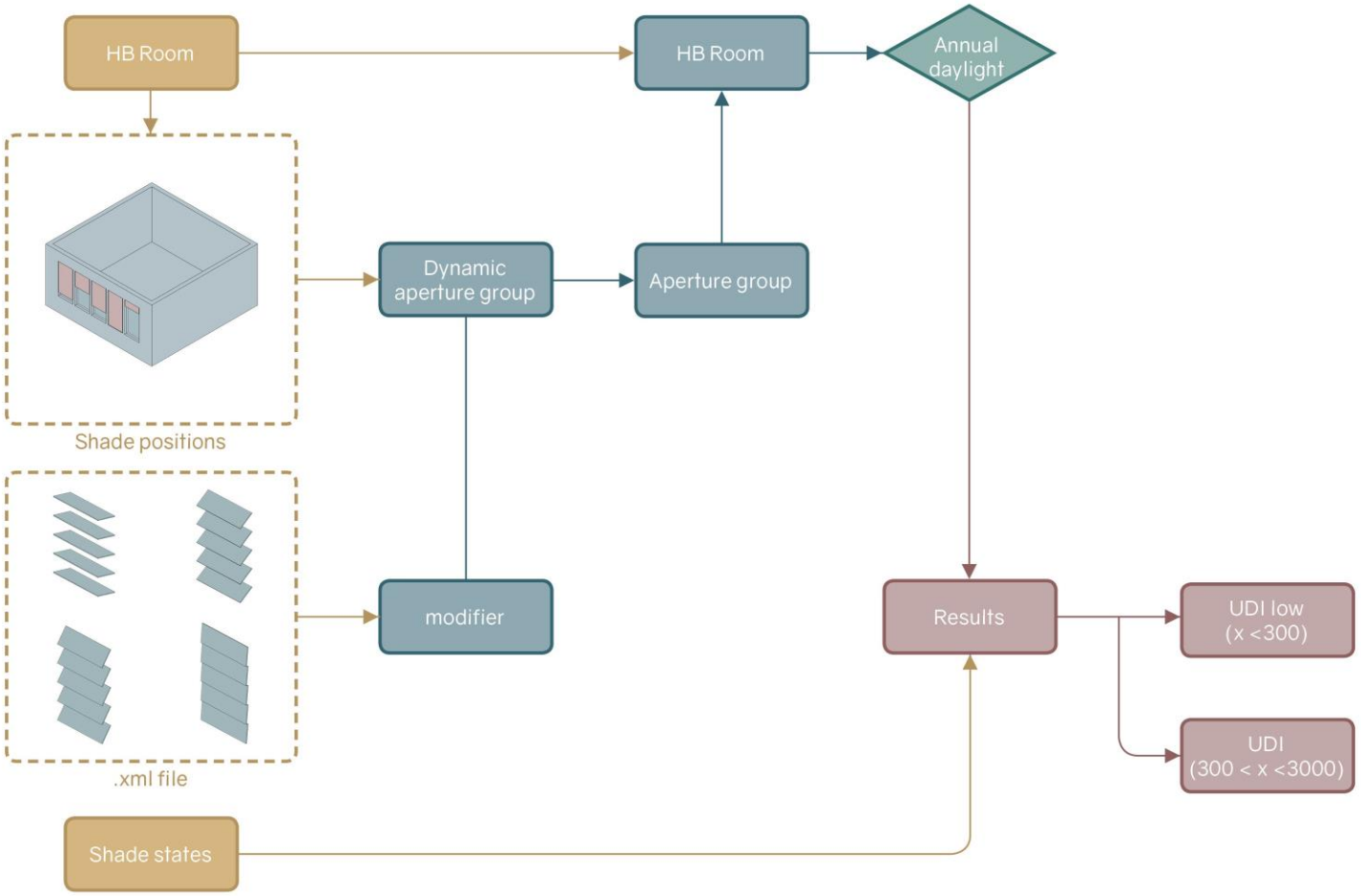
[03] Shade Evaluation

BSDF workflow



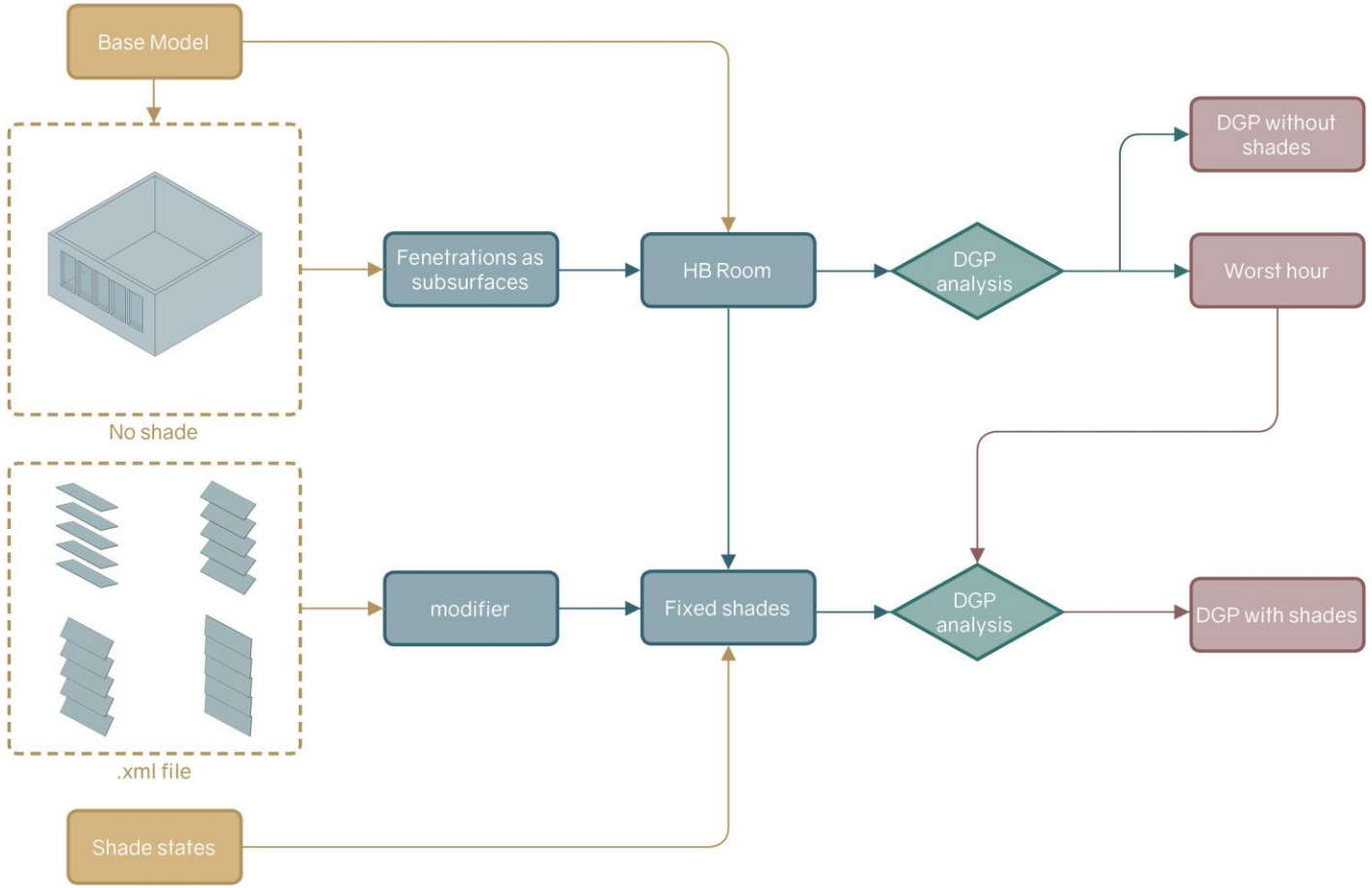
[03] Shade Evaluation

Daylight workflow



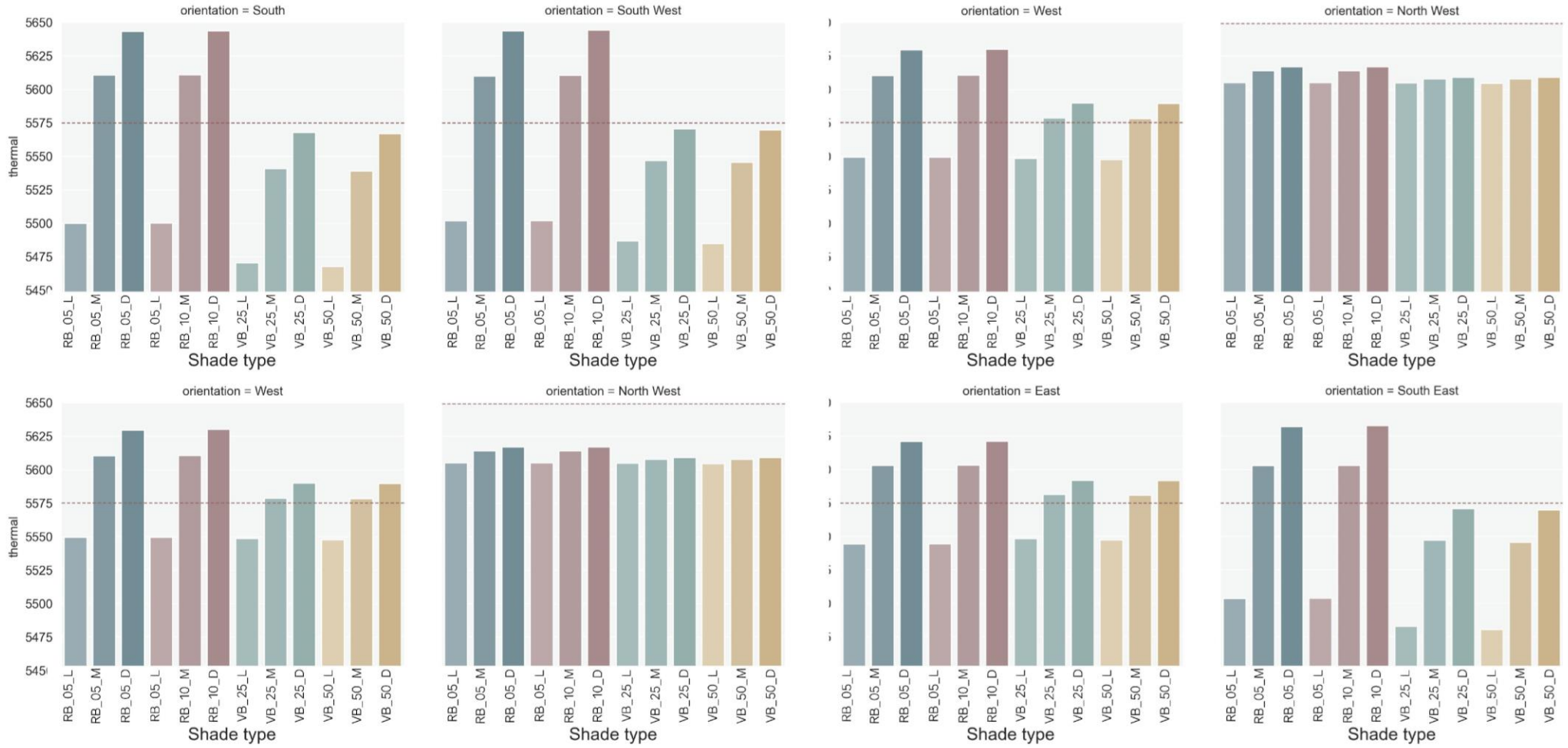
[03] Shade Evaluation

Glare workflow



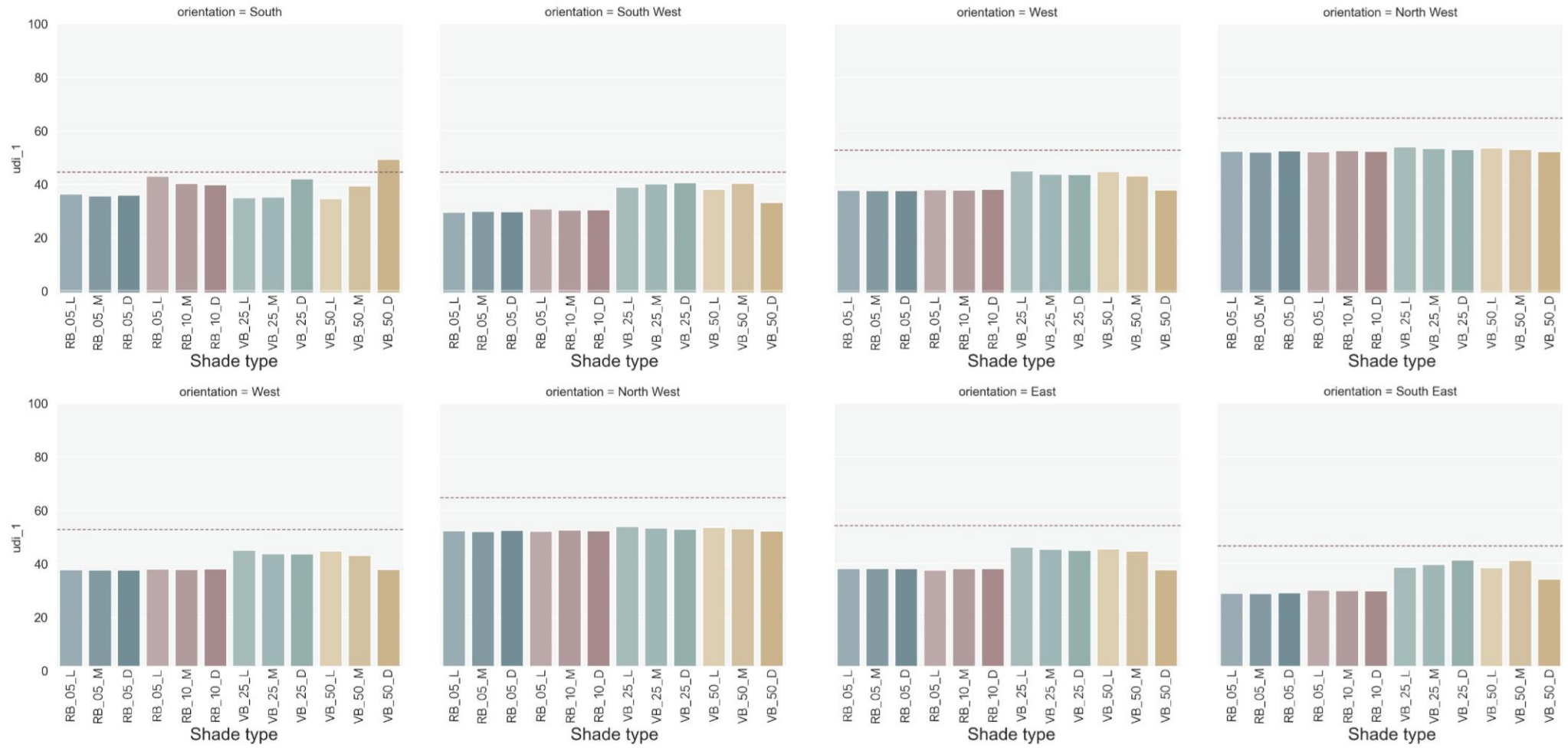
[03] Shade Evaluation

Thermal Discomfort Rating



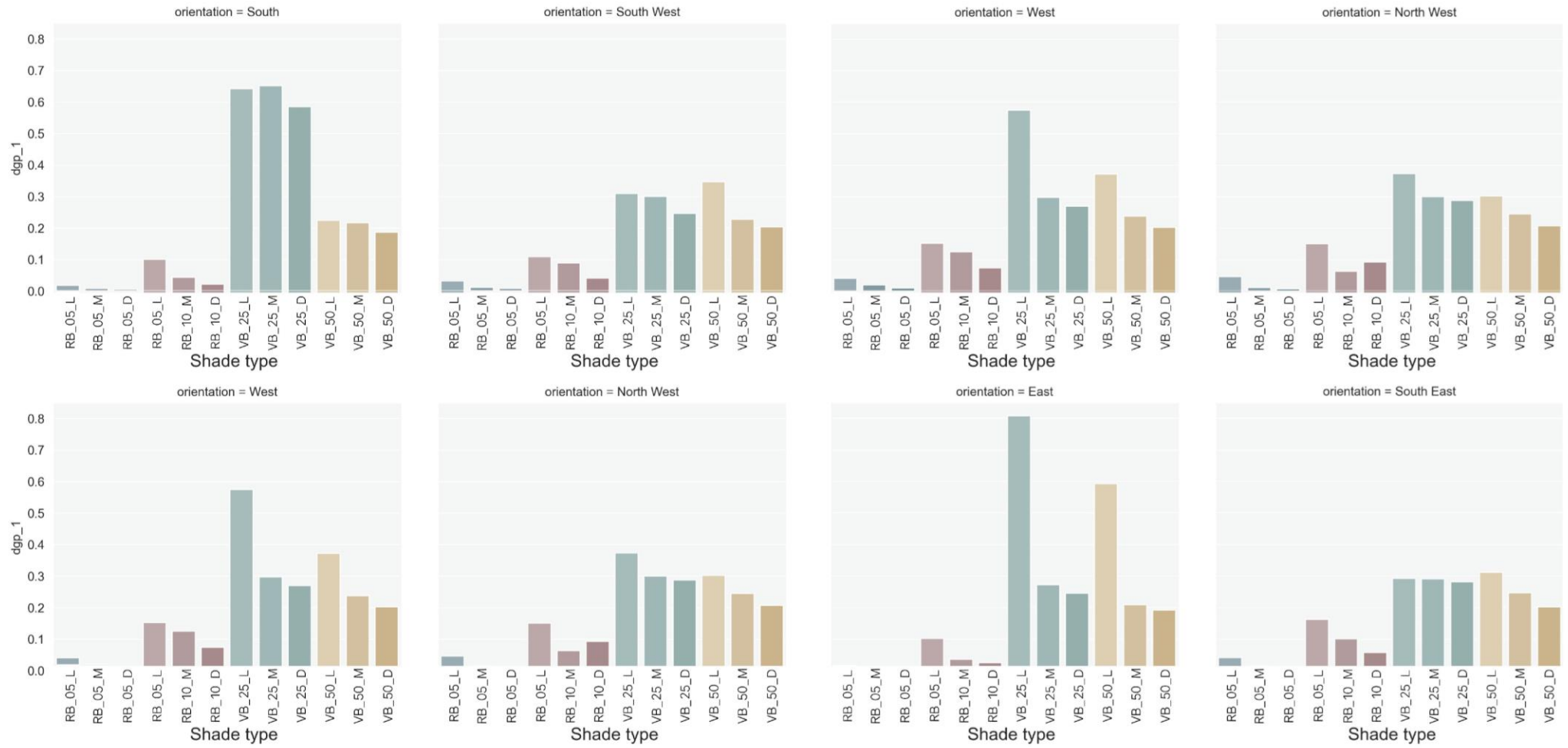
[03] Shade Evaluation

Useful Daylight Illuminance



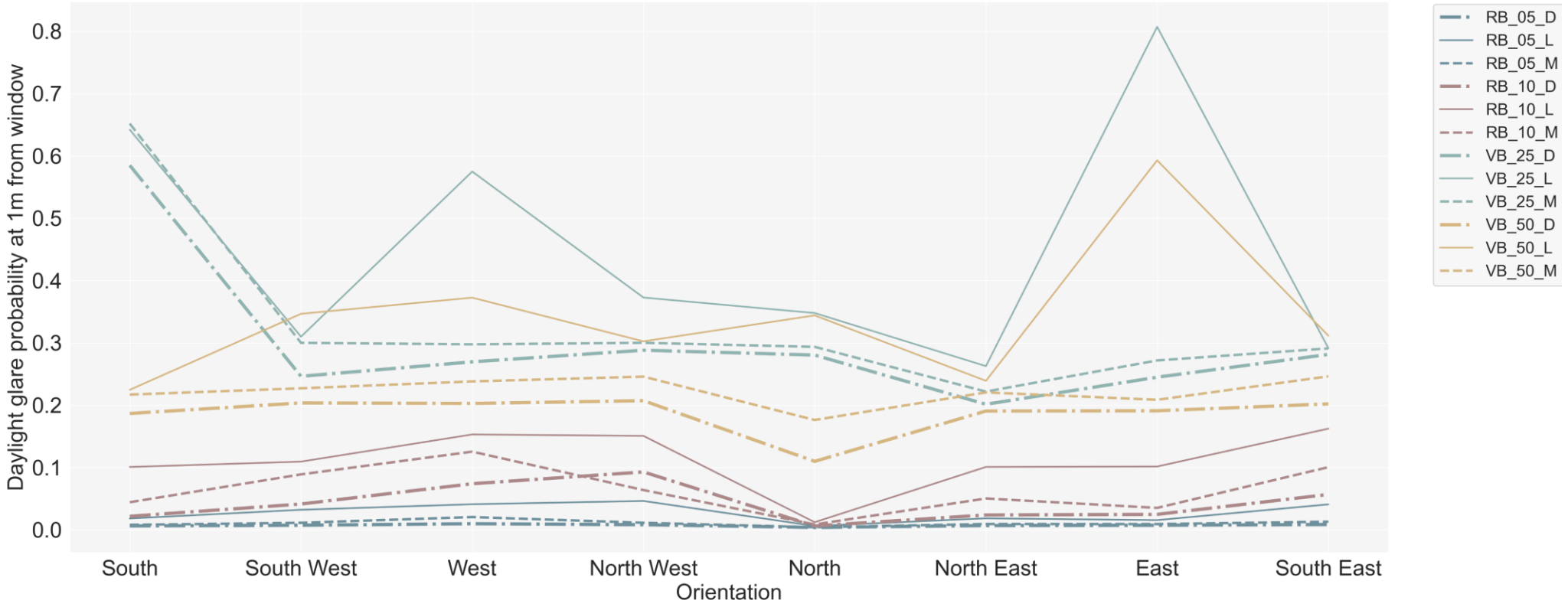
[03] Shade Evaluation

Daylight Glare Probability



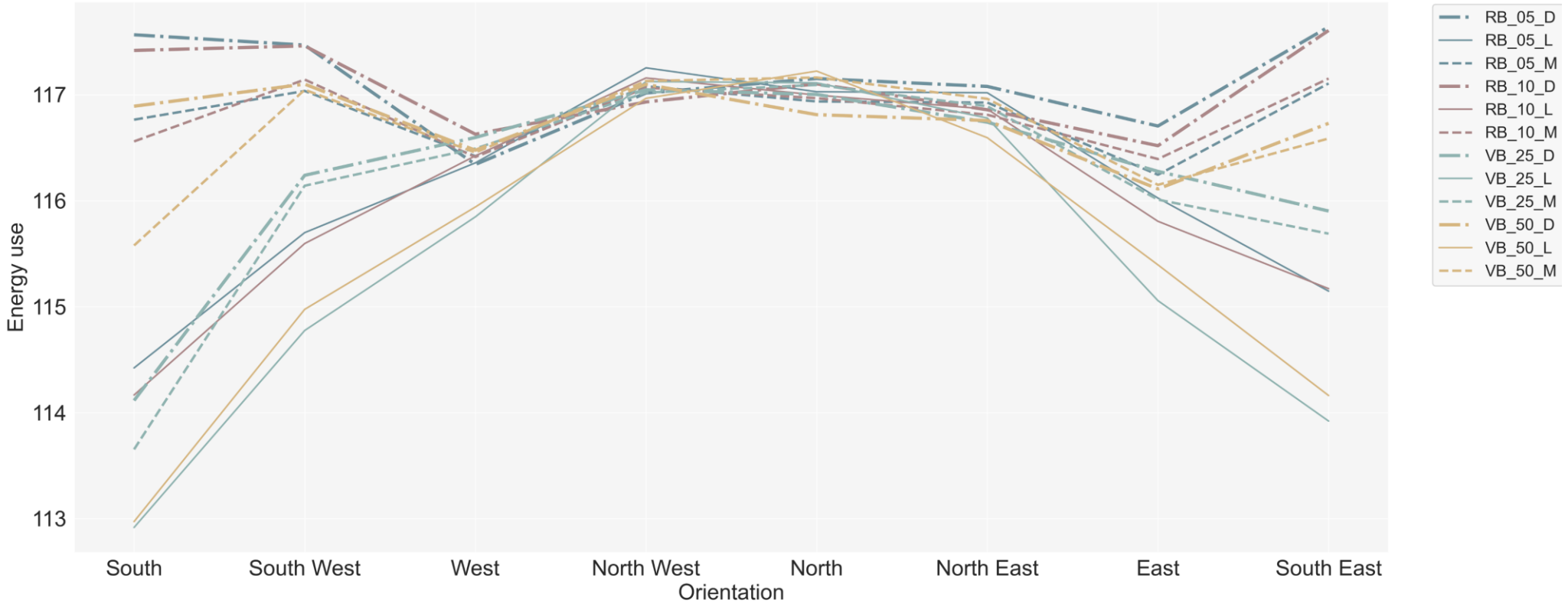
[B] Annex

Shading Technologies



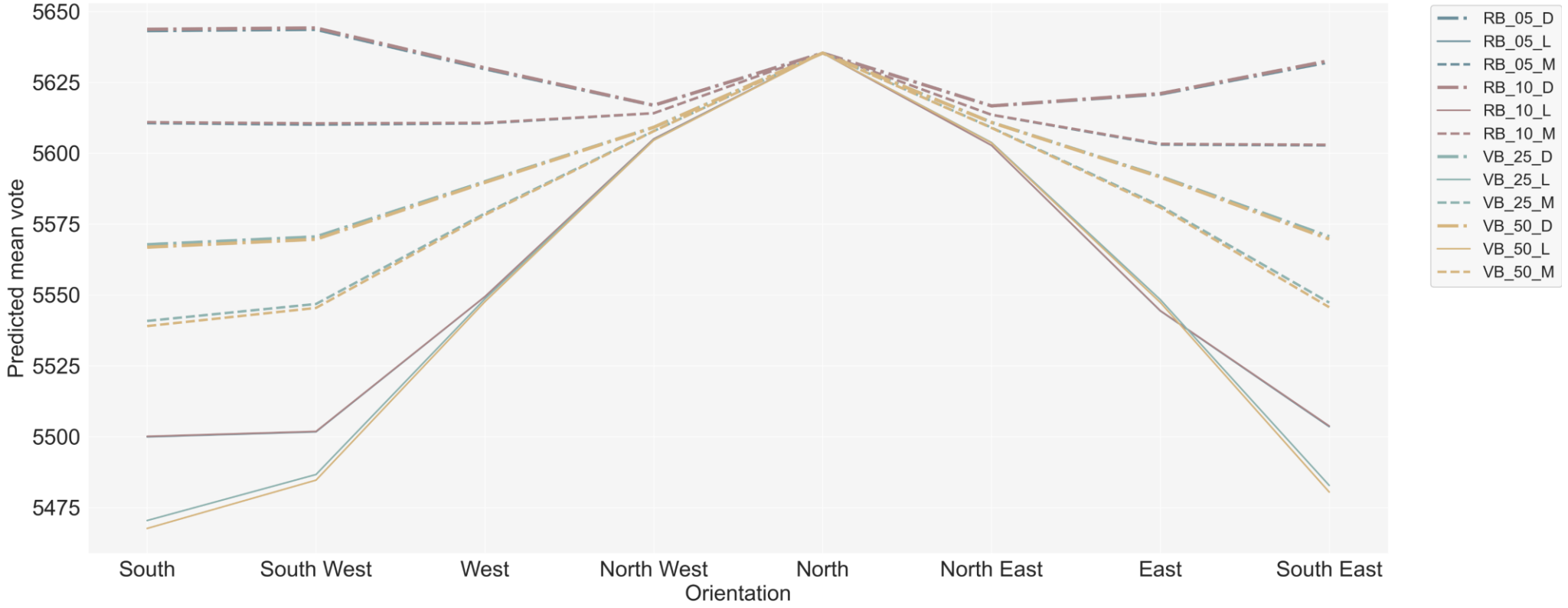
[B] Annex

Shading Technologies



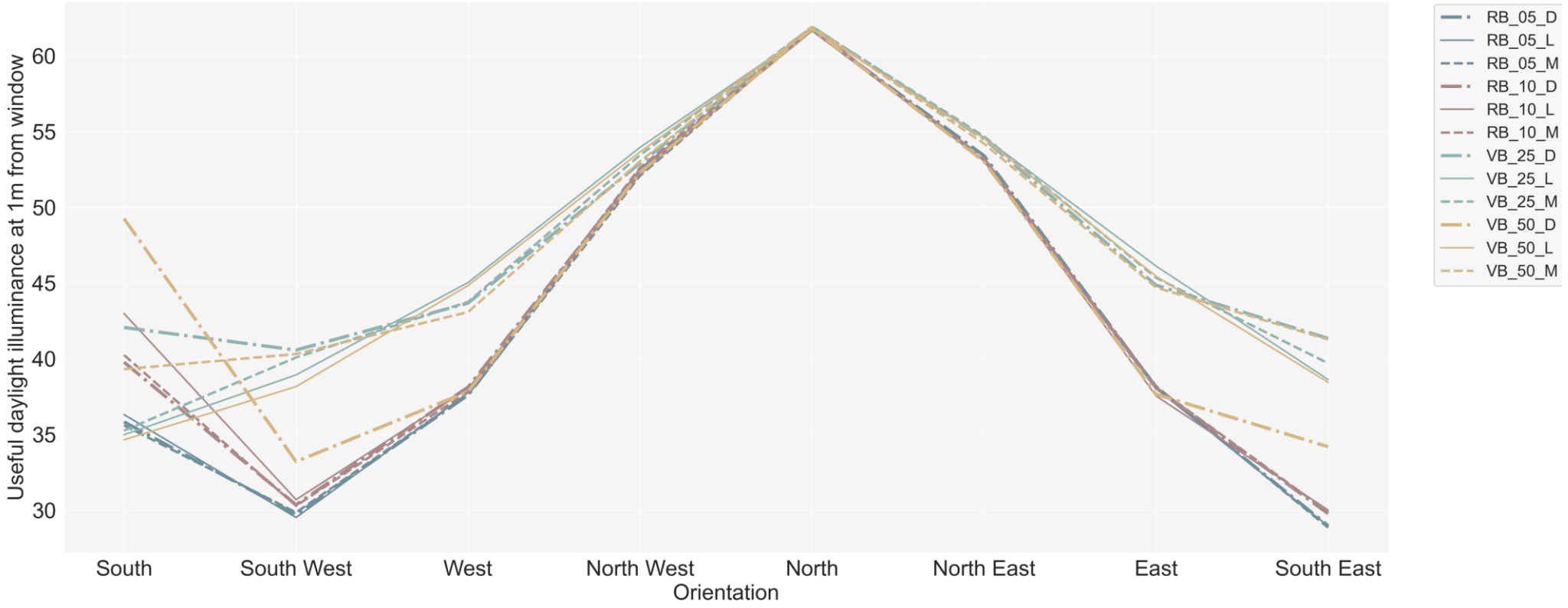
[B] Annex

Shading Technologies



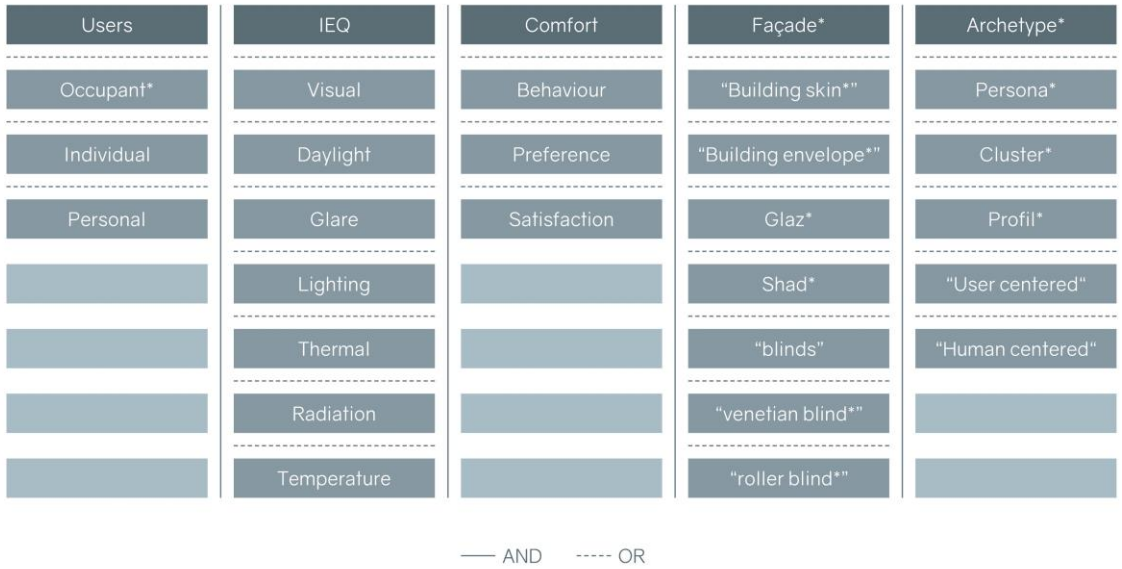
[B] Annex

Shading Technologies



[04] Occupant Preference

Systematic Literature Review



[04] Occupant Preference

Systematic Literature Review

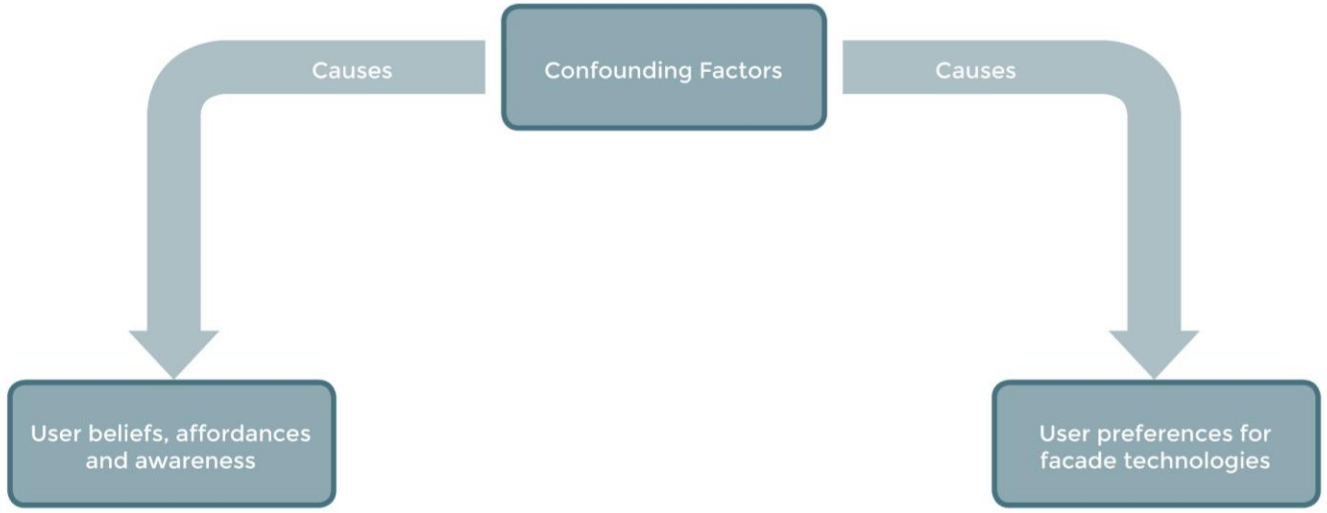
	Thermal	Visual	View	Control	Vibration	Acoustical	IAQ	Energy	Design
Personal Descriptors	22	19	12	3	0	18	17	7	5
Lifestyle choices	13	9	6	3	0	9	8	6	2
Health issues	11	11	7	3	0	11	10	3	1
Psychological factors	20	20	11	3	0	15	14	8	3
Interior parameters	14	14	7	1	0	10	9	6	4
Building information	13	14	8	1	0	10	9	7	4
Location and weather	9	8	6	1	0	7	7	5	2
Thermal	23	17	12	3	0	16	15	7	3
Visual	19	21	12	3	0	16	15	3	4
View	11	14	9	1	0	11	11	0	3
Control	12	12	7	1	0	9	9	6	1
Vibration	4	4	3	2	1	4	4	0	1
Acoustical	14	13	11	3	0	13	12	2	2
IAQ	17	14	10	2	0	14	13	3	3

[04] Occupant Preference

Conceptual Framework

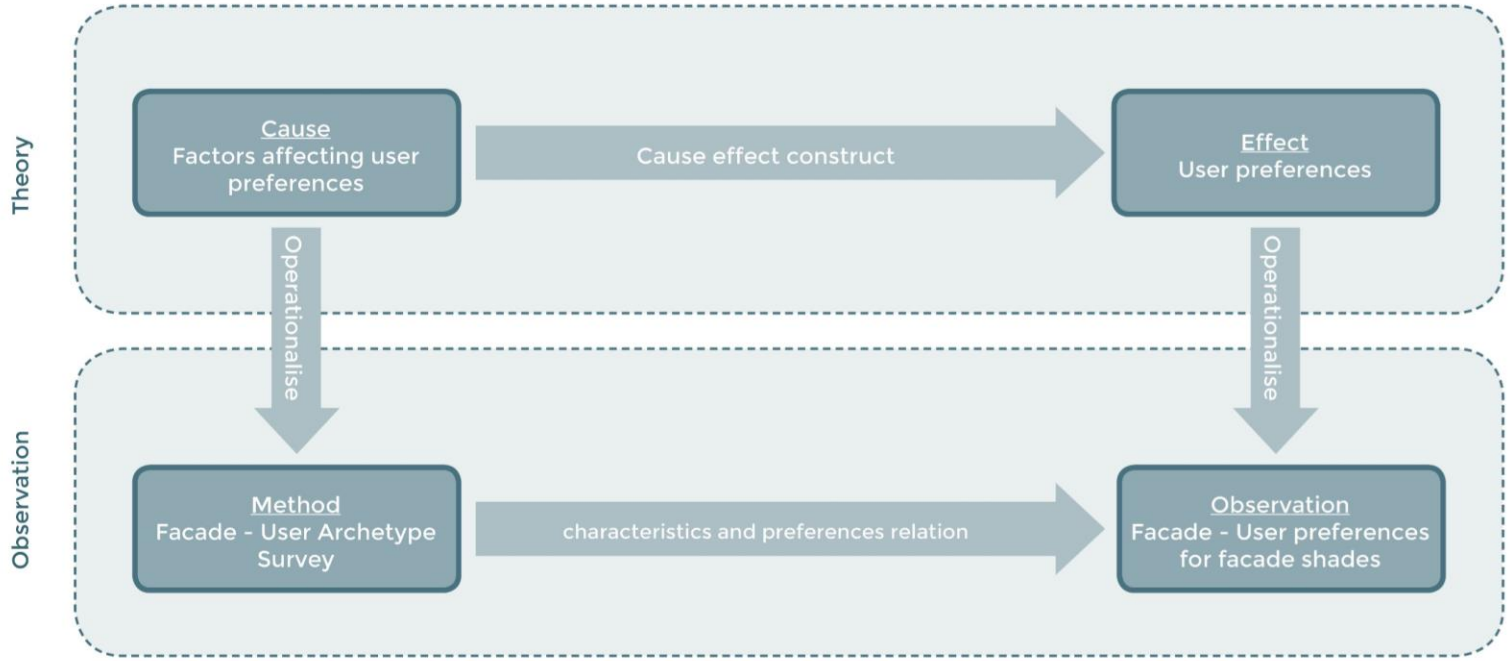
[04] Occupant Preference

Conceptual Framework



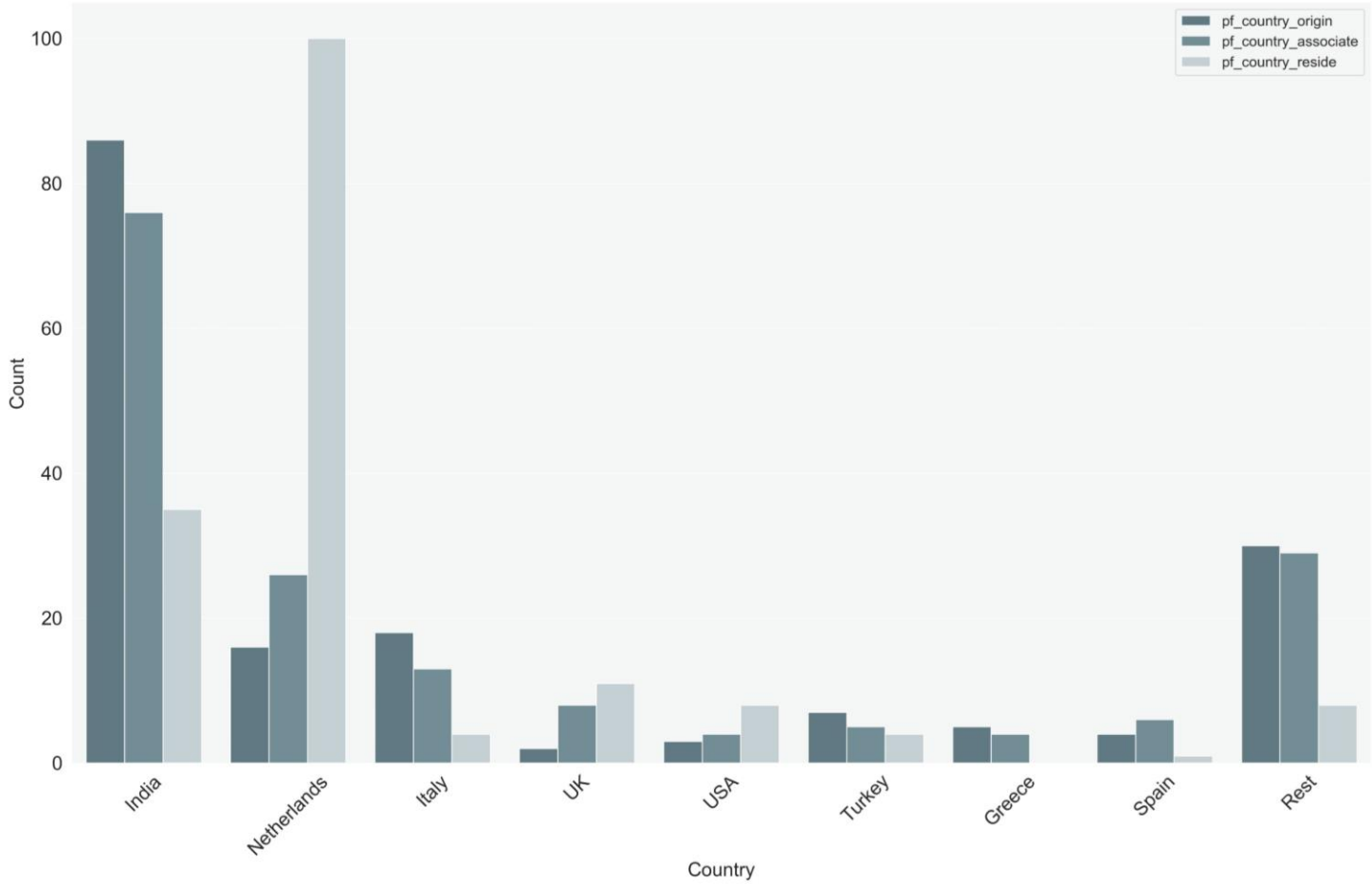
[04] Occupant Preference

Conceptual Framework



[04] Occupant Preference

Survey responses



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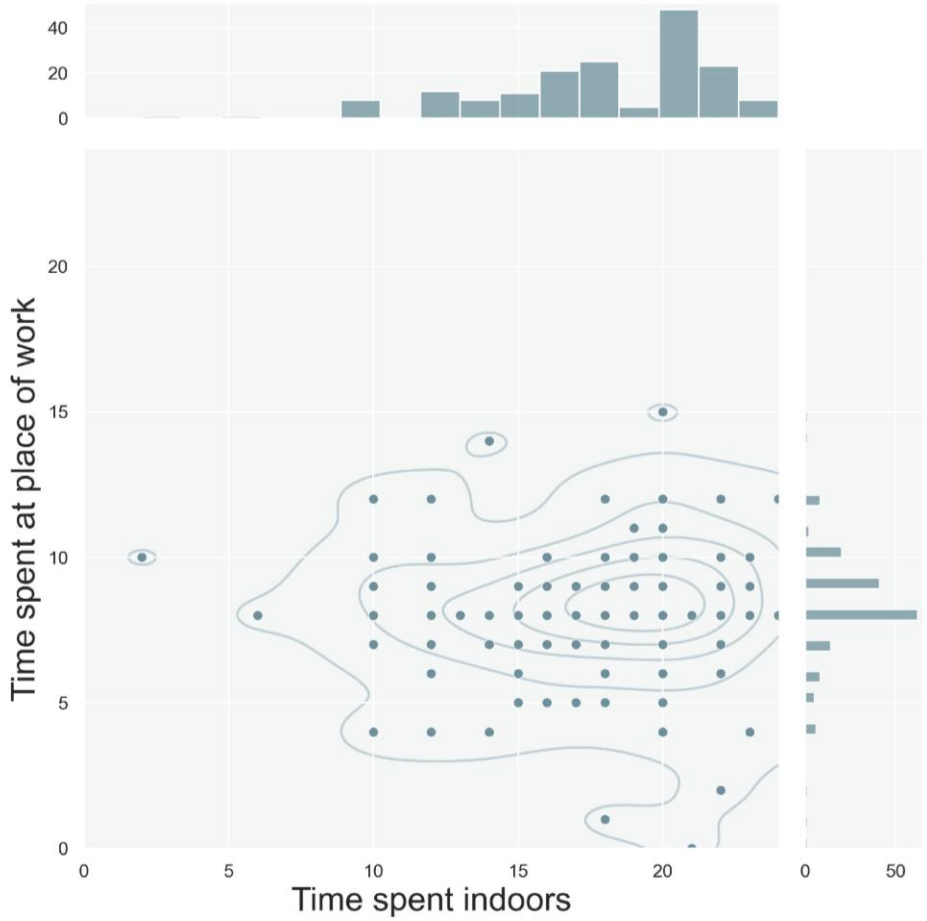
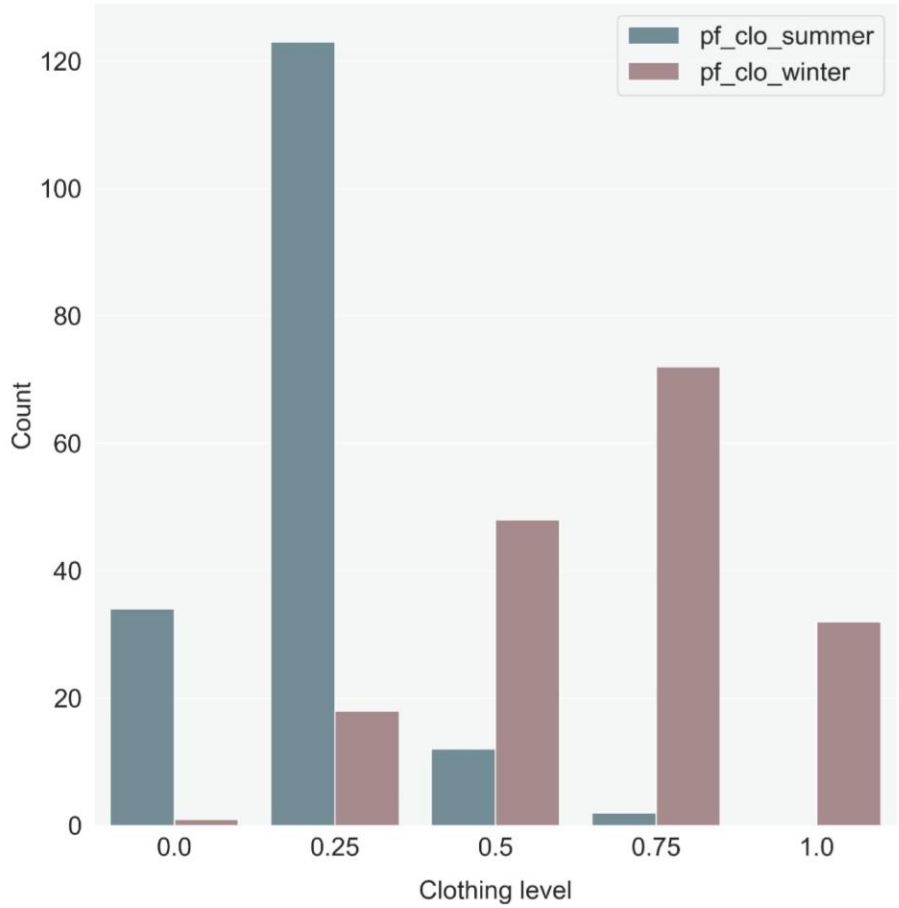
Survey responses





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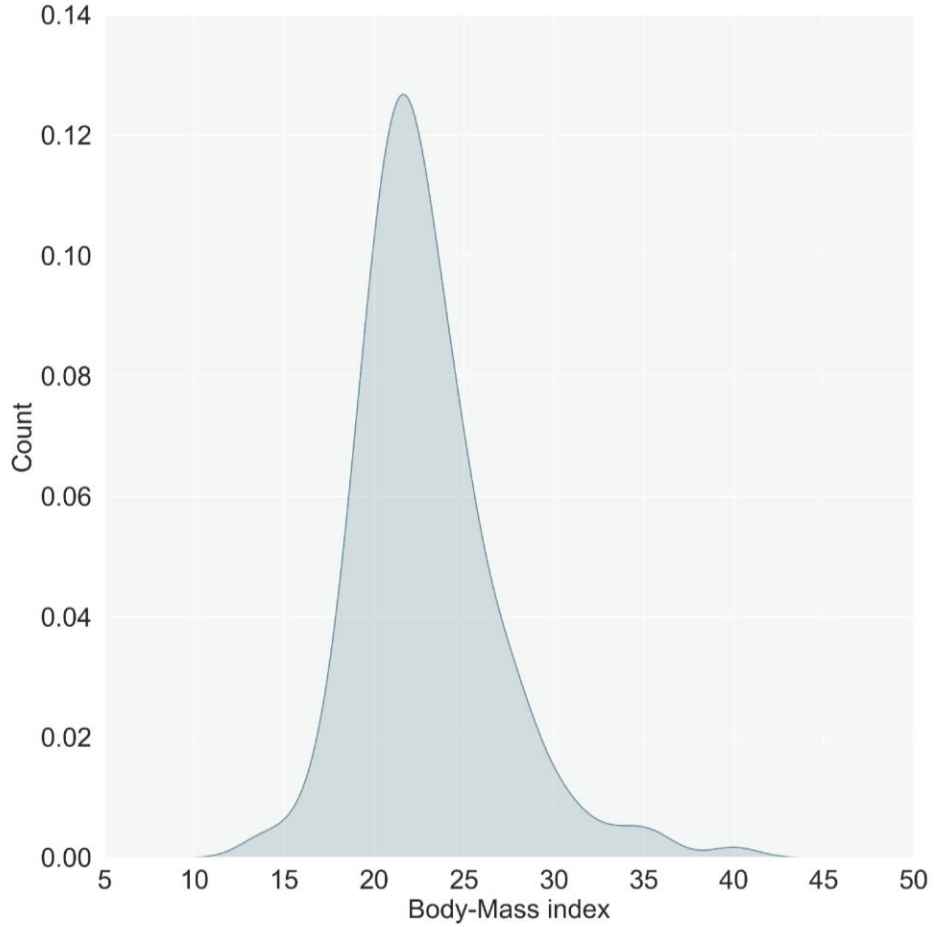
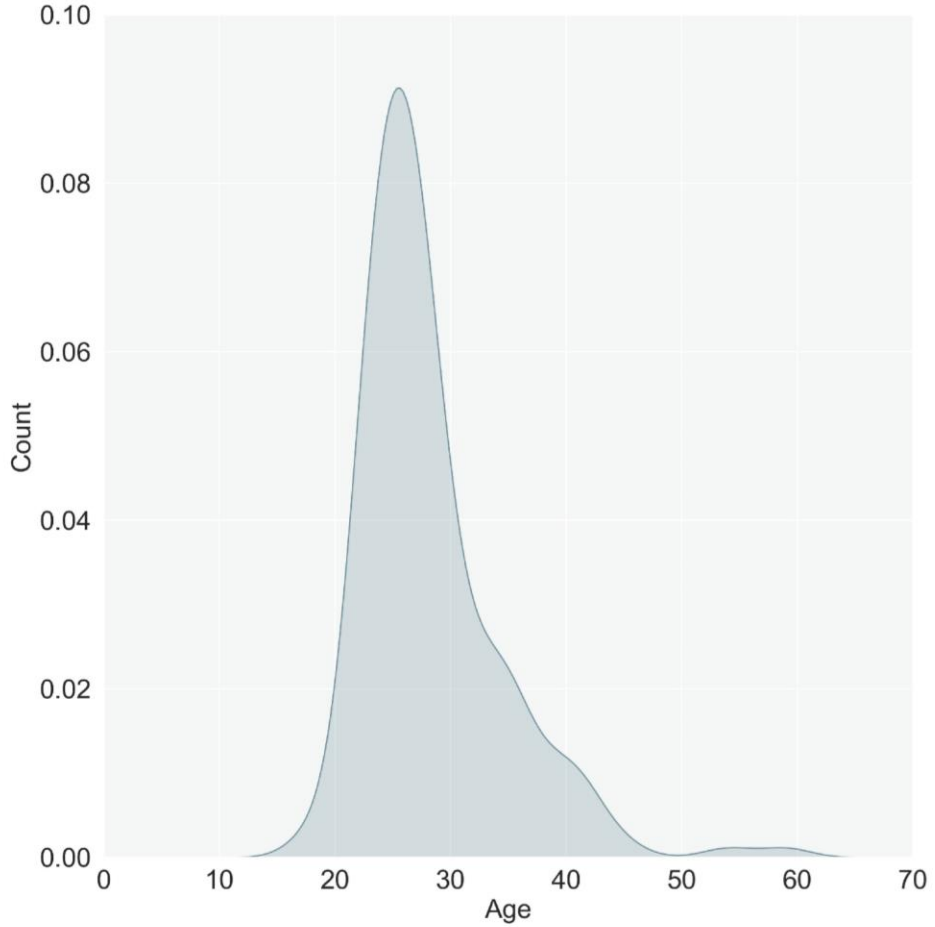
Survey responses





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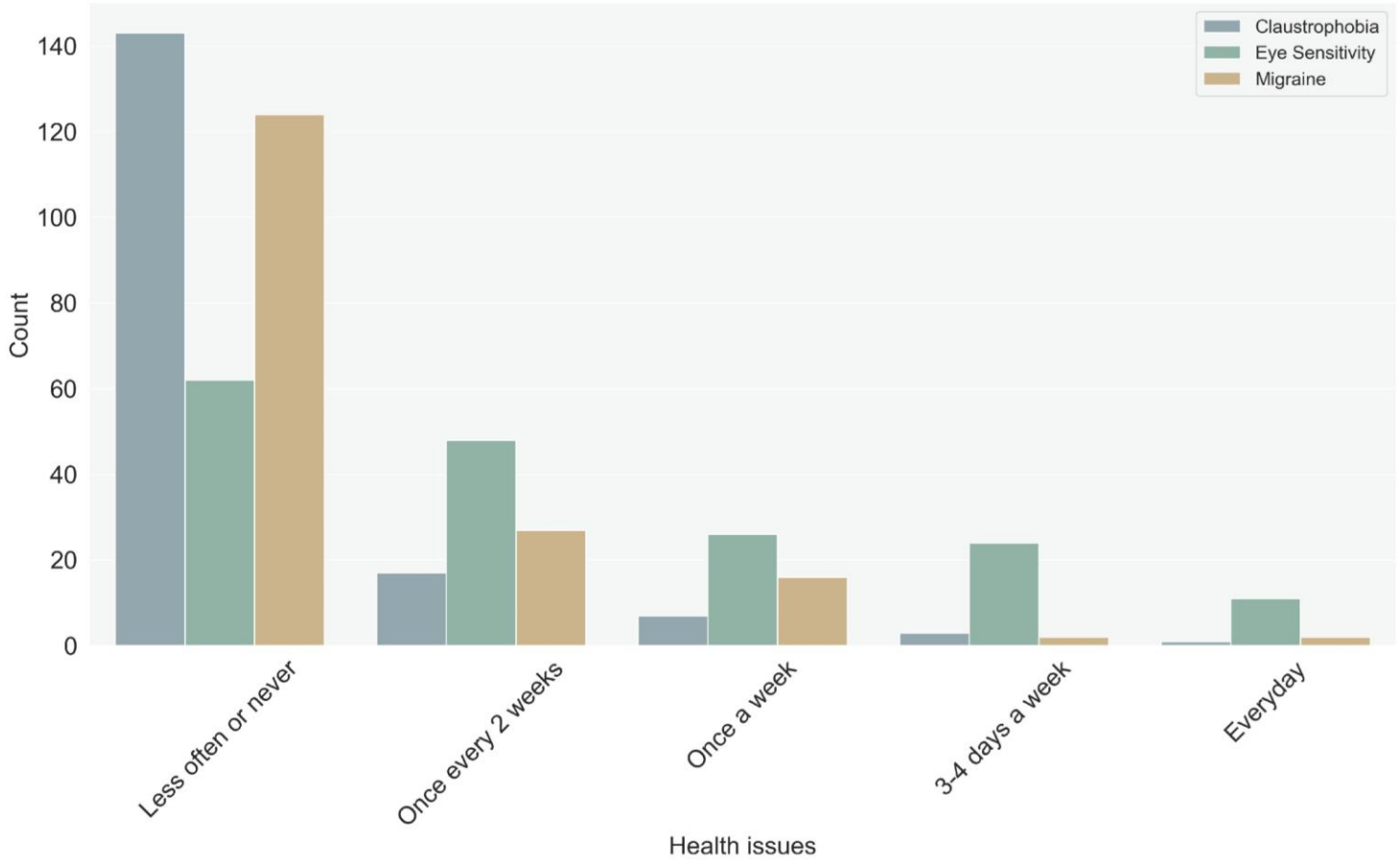
Survey responses



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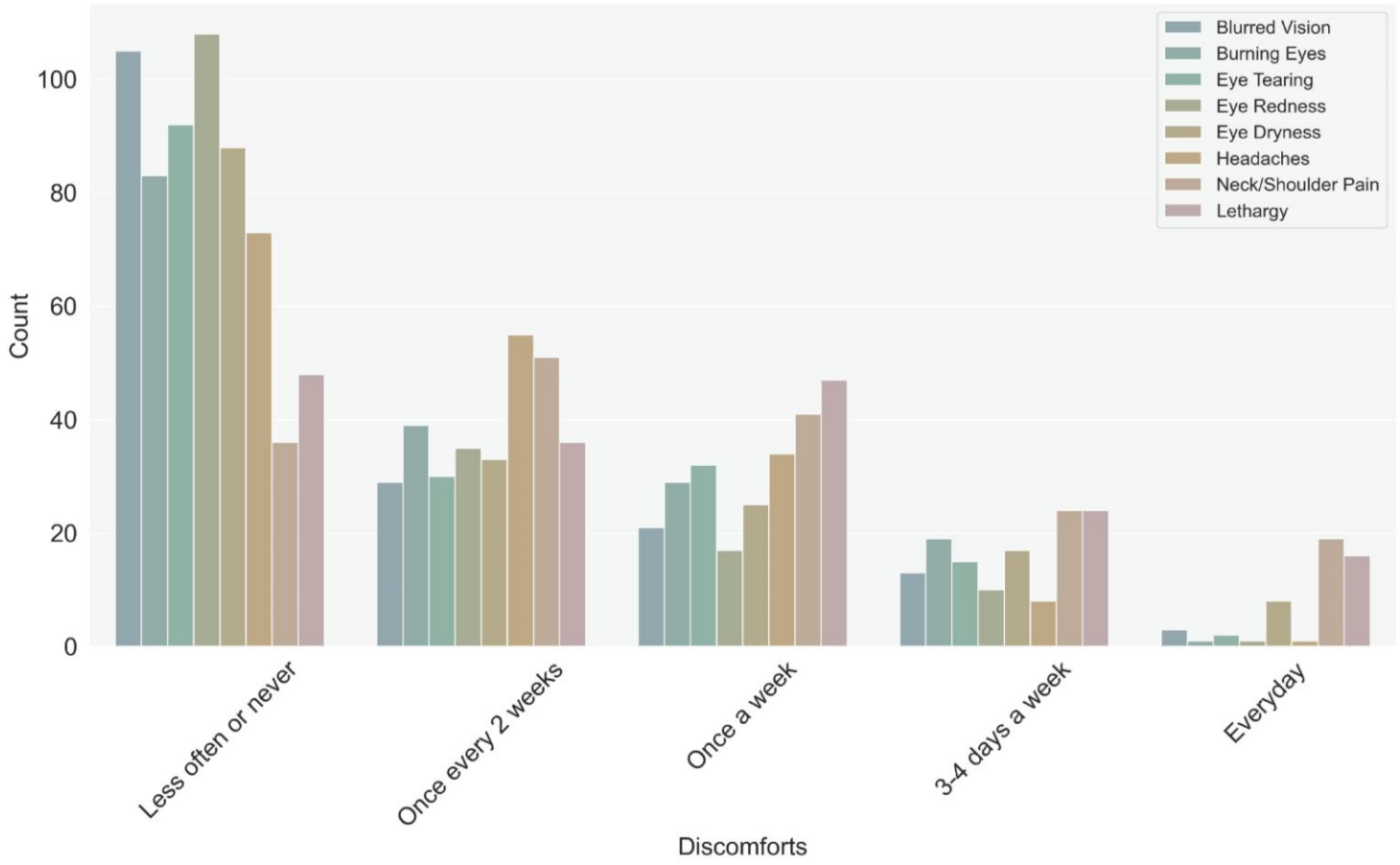
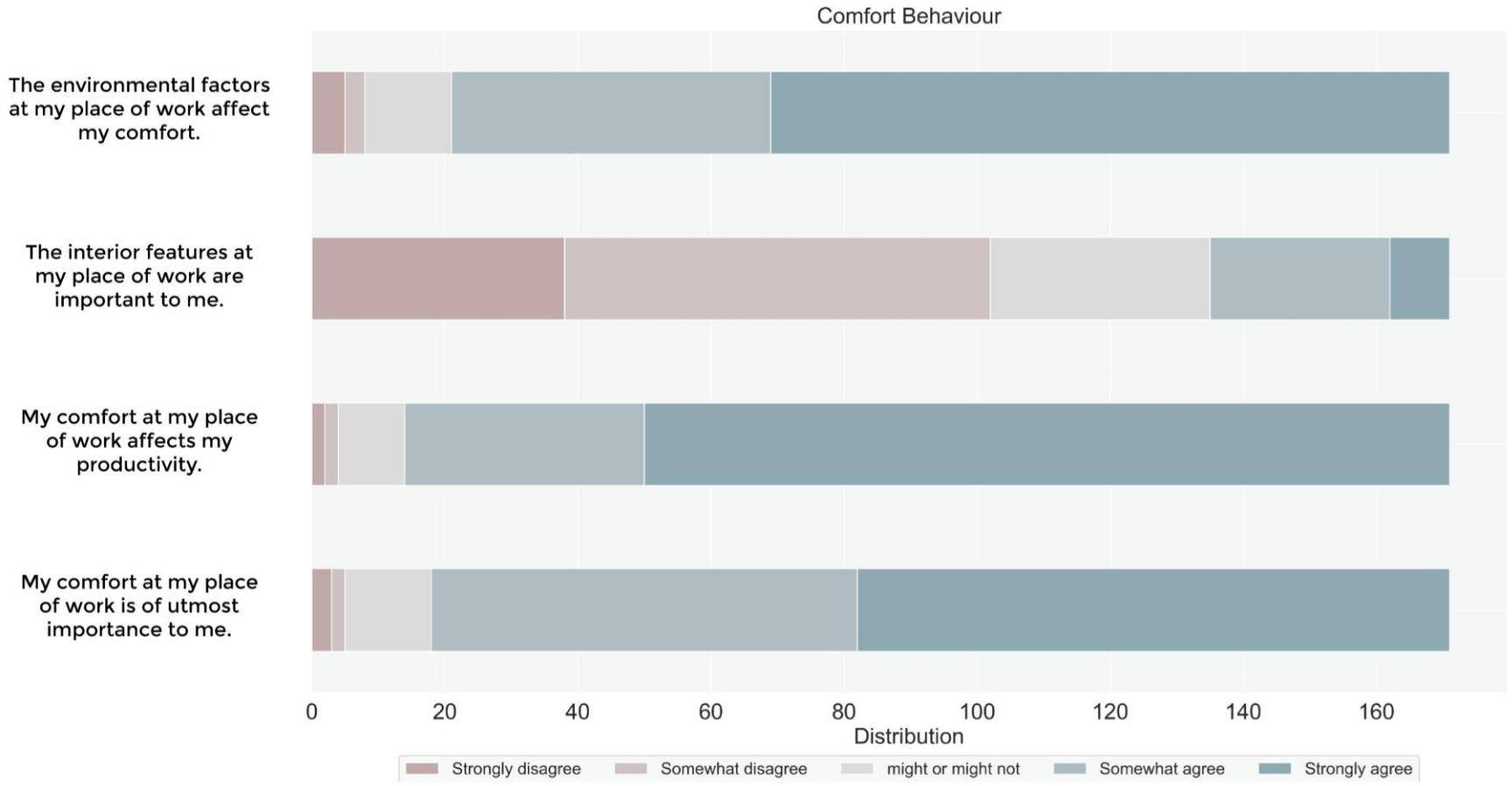
Survey responses



[04] Occupant Preference

Survey responses



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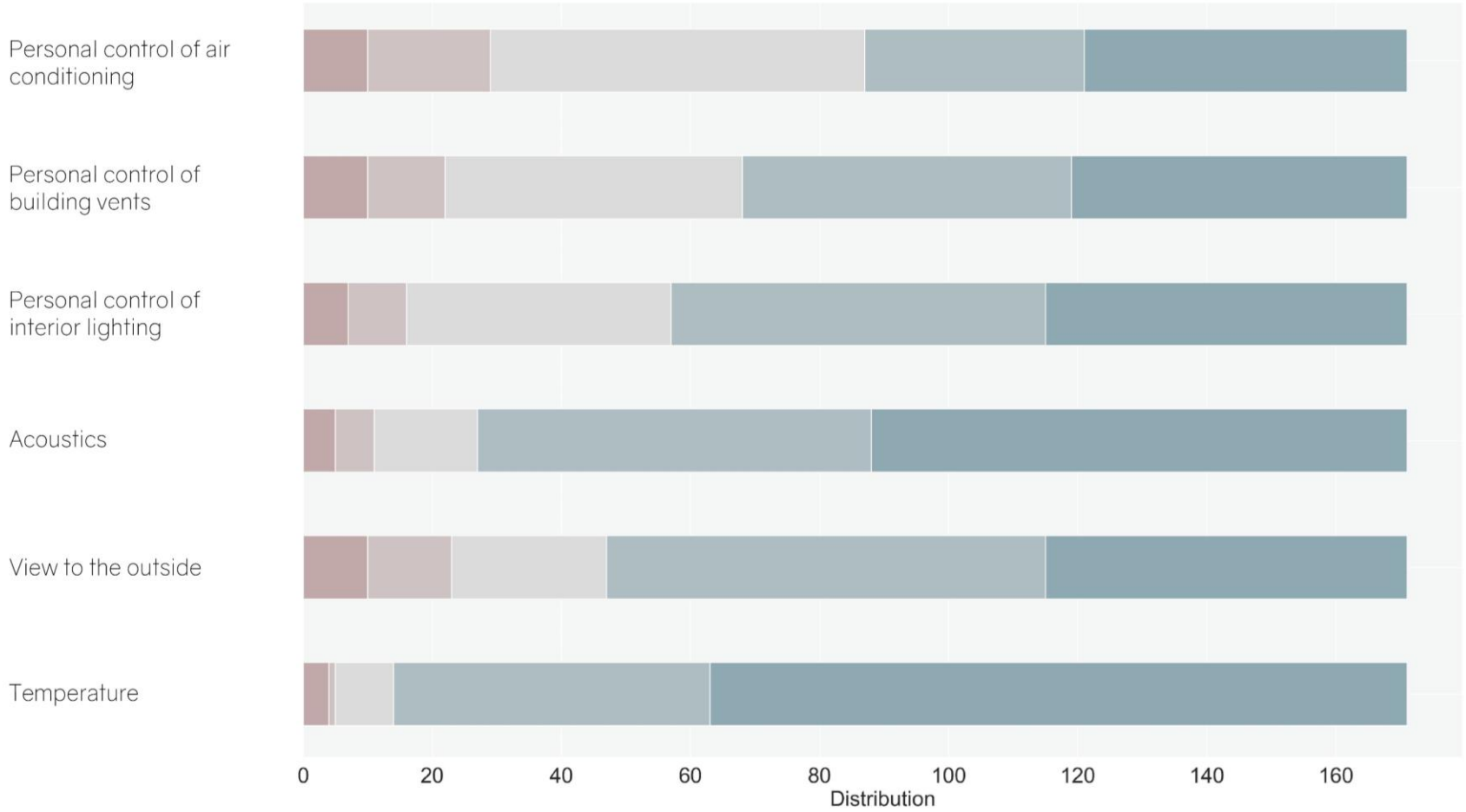
Survey responses



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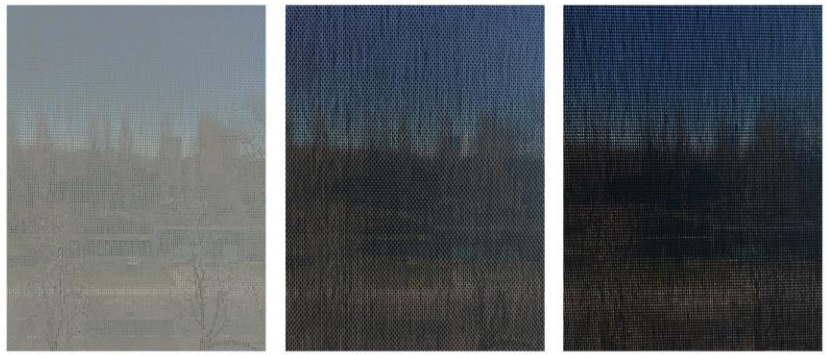
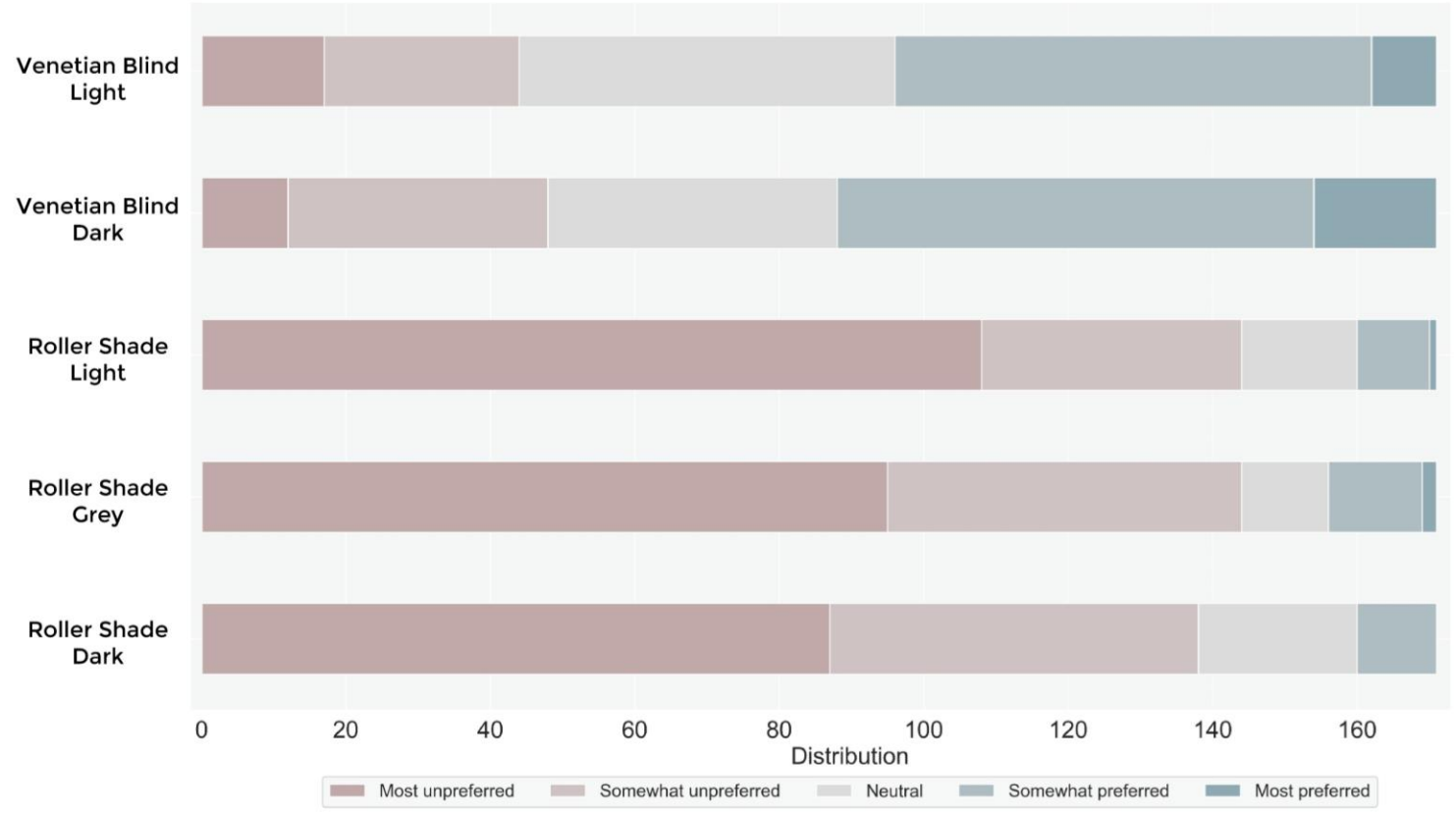
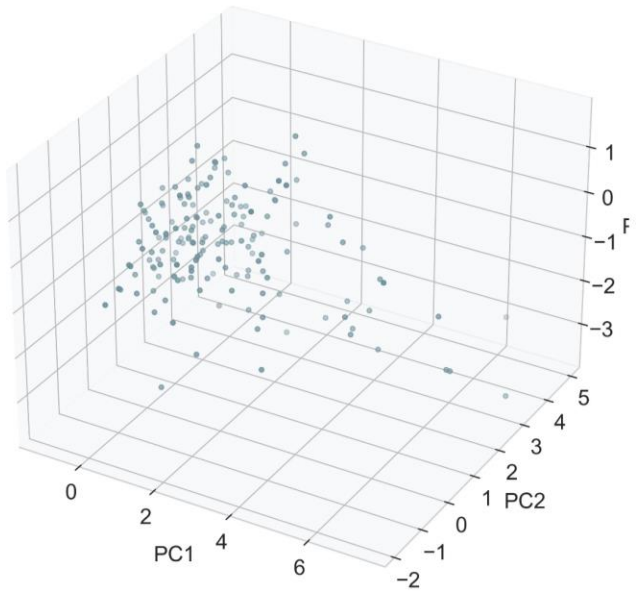
Survey responses

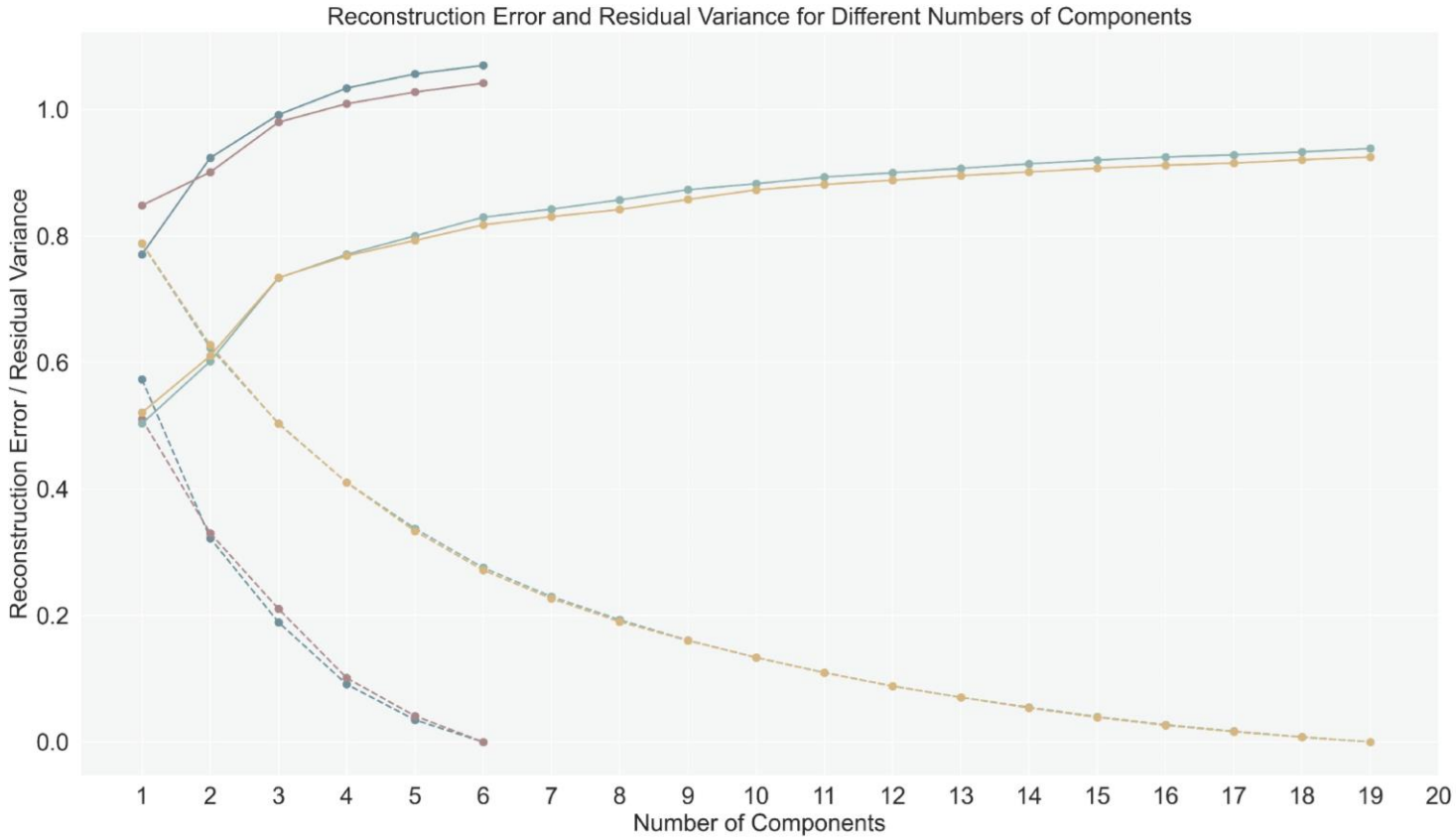




[05] Façade-User Archetypes

Principle Component Analysis





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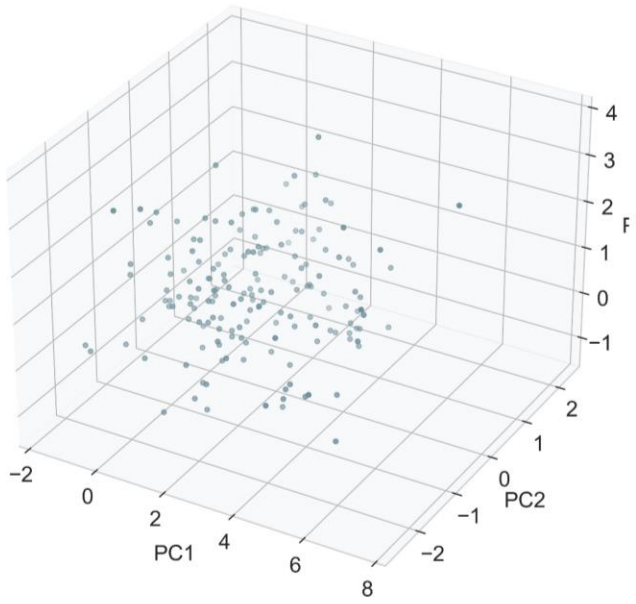
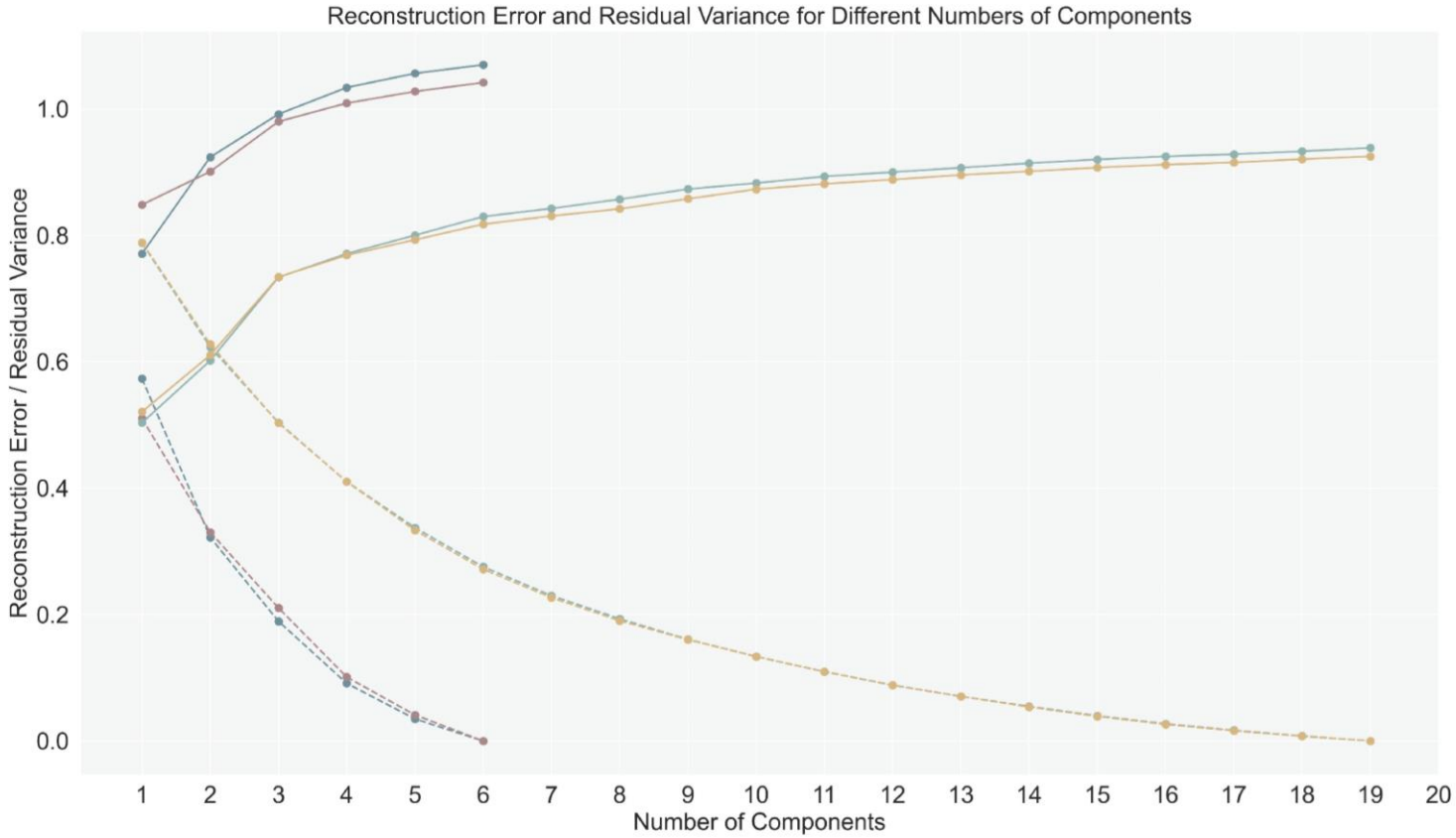
Principle Component Analysis





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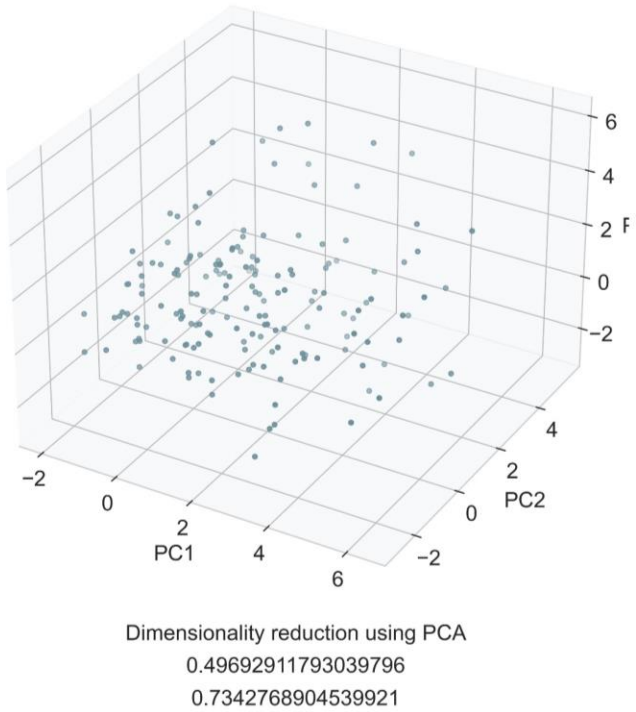
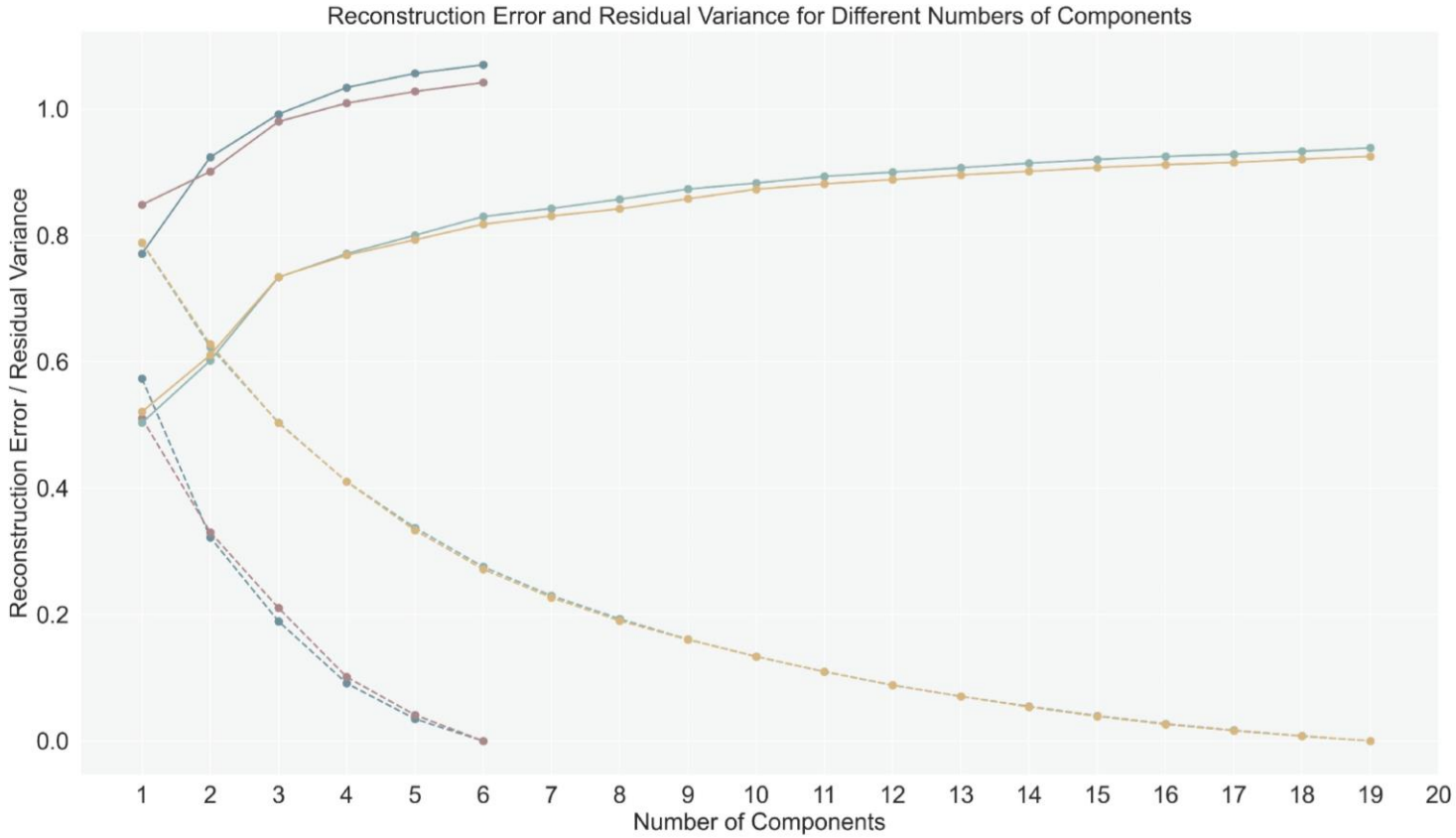
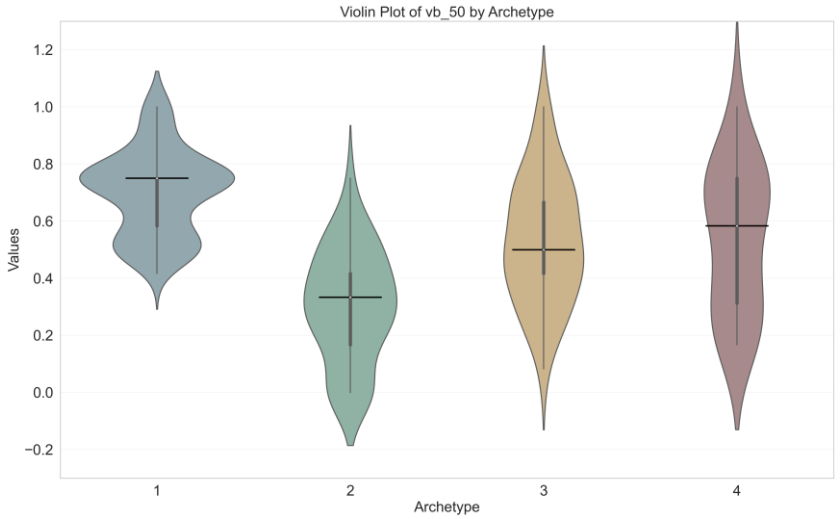
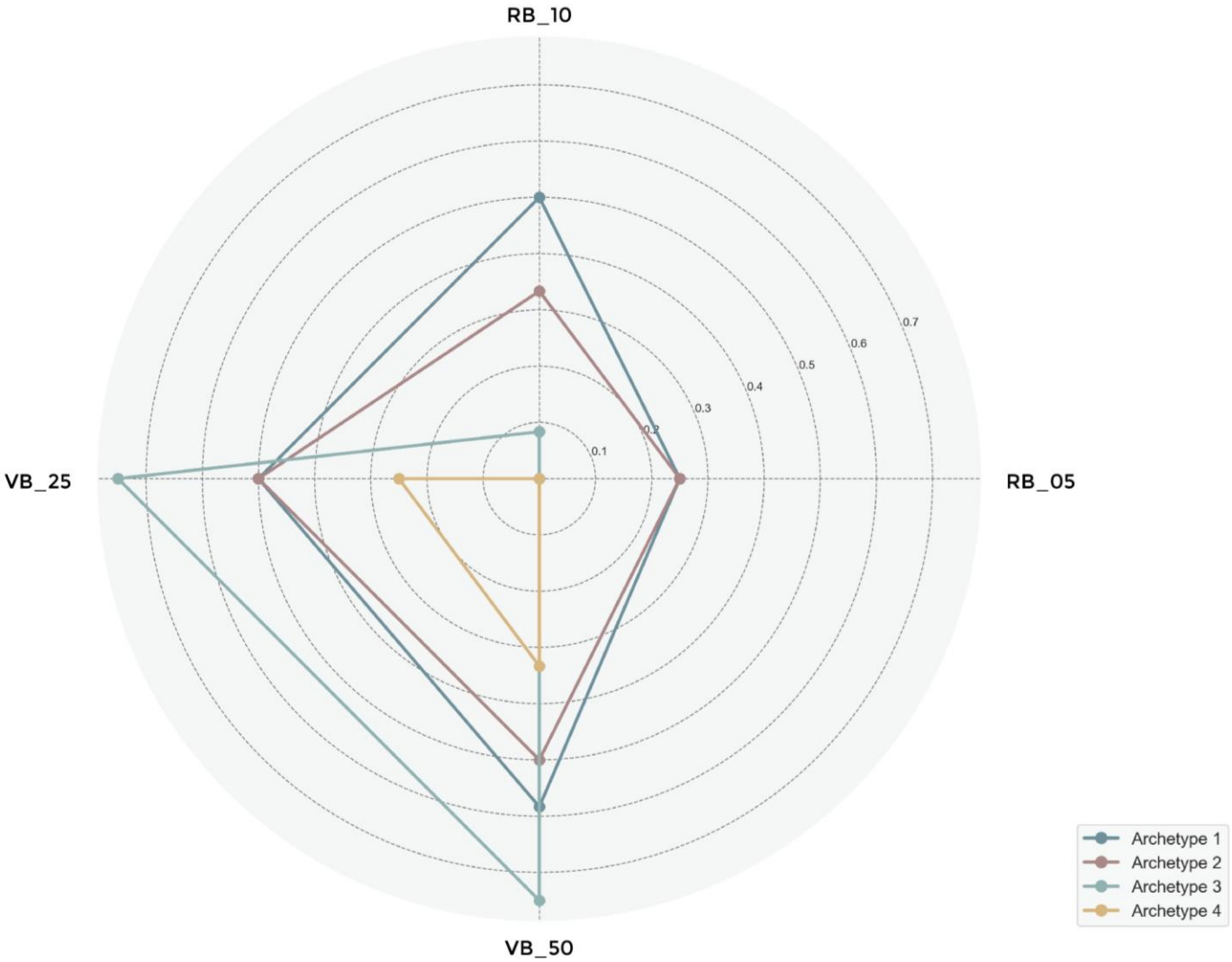




[05] Façade-User Archetypes

Archetype analysis





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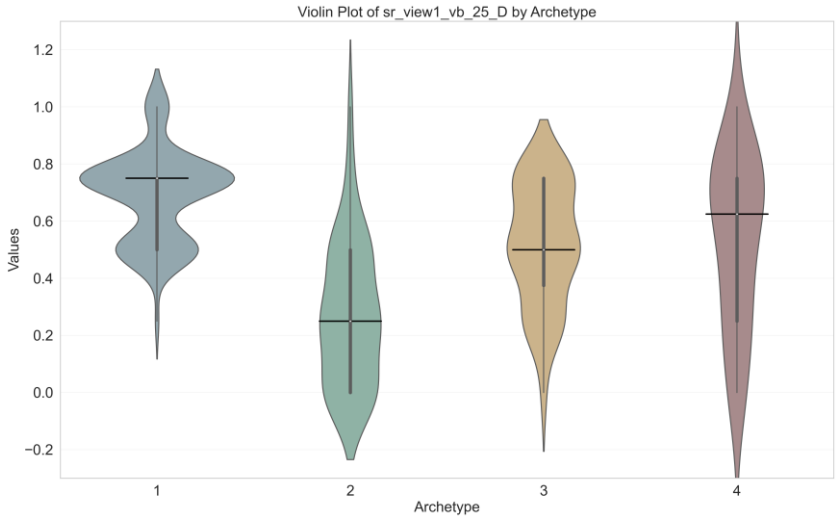
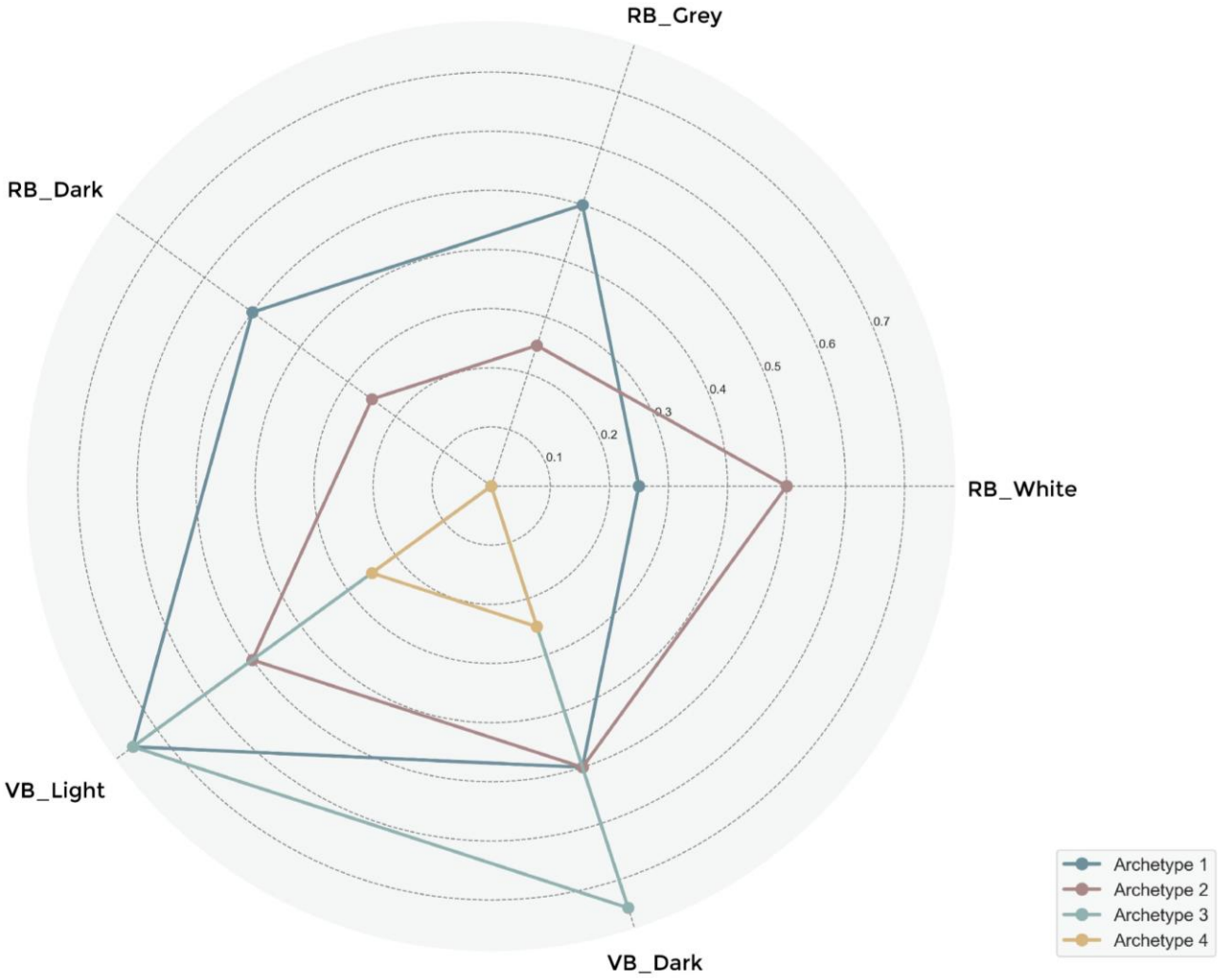
Archetype analysis





[05] Façade-User Archetypes

Archetype analysis