Henning Larsen

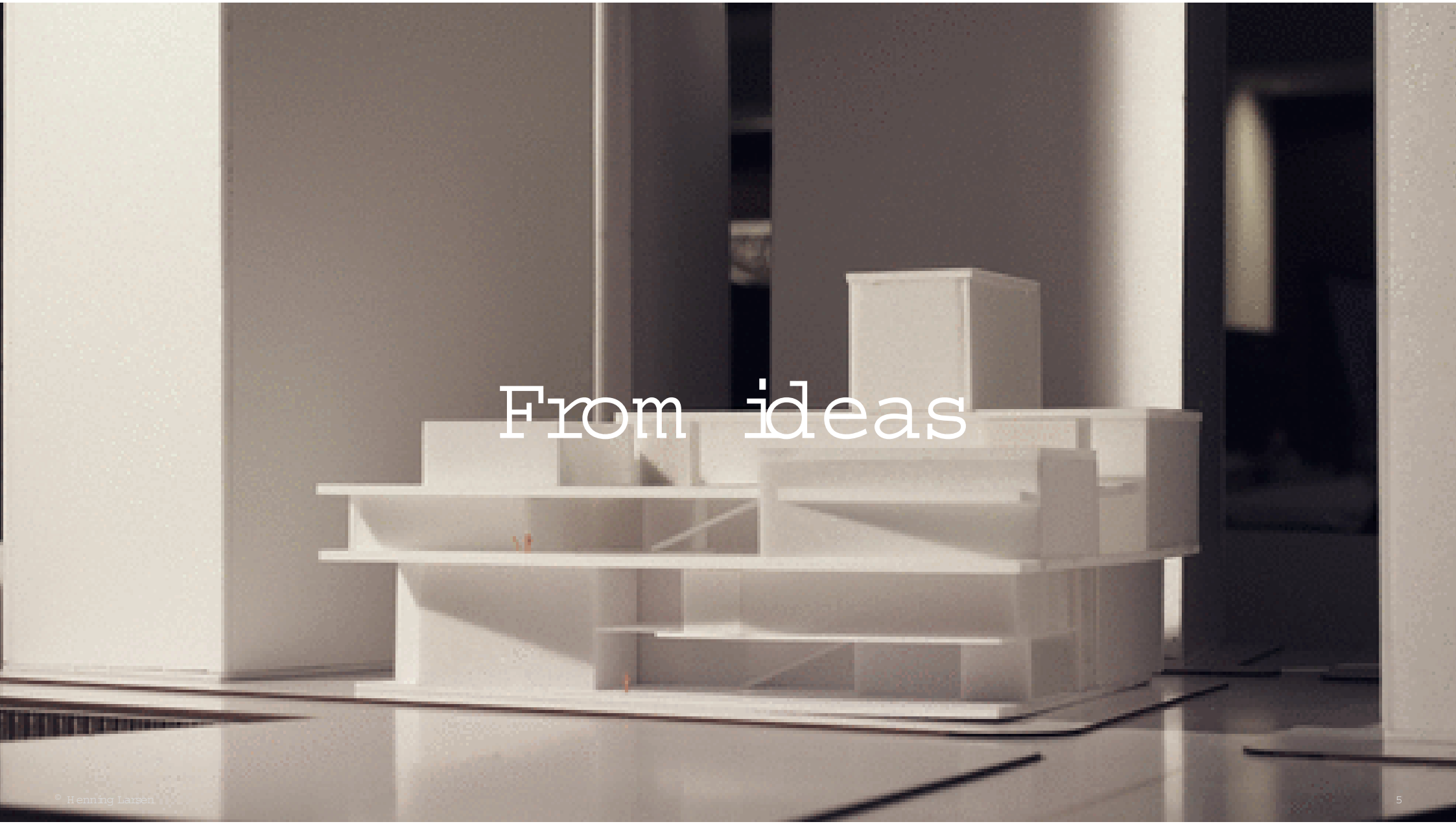
Design with impact

Looking at the healthy buildings of the future

Jakob Strømann-Andersen

Partner, Head of Sustainability Engineering

7 offices
300 colleagues
32 nationalities
20 countries



By 2050, 68% of the world's population will live in cities.

Source: UN Department of Economic and Social Affairs

AK2

A Time of Complex Challenges

Hurricane Harvey/Port Arthur, TX, USA

Snímek 10

AK2 1. question topics should correlate direclty to HLA projects shown later; 2. image and questions can be swapped out for a lecture with different focus - eg. community space vs. sustainable design from an energy/resource/climate perspective

Andrea Kahn; 6.12.2018

What is the future relevance of architects?

The Architect as the Master Sketcher

Photo © Chicago History Museum by Arthur Siegel

Ludwig Mies van der Rohe
(1886 – 1969)

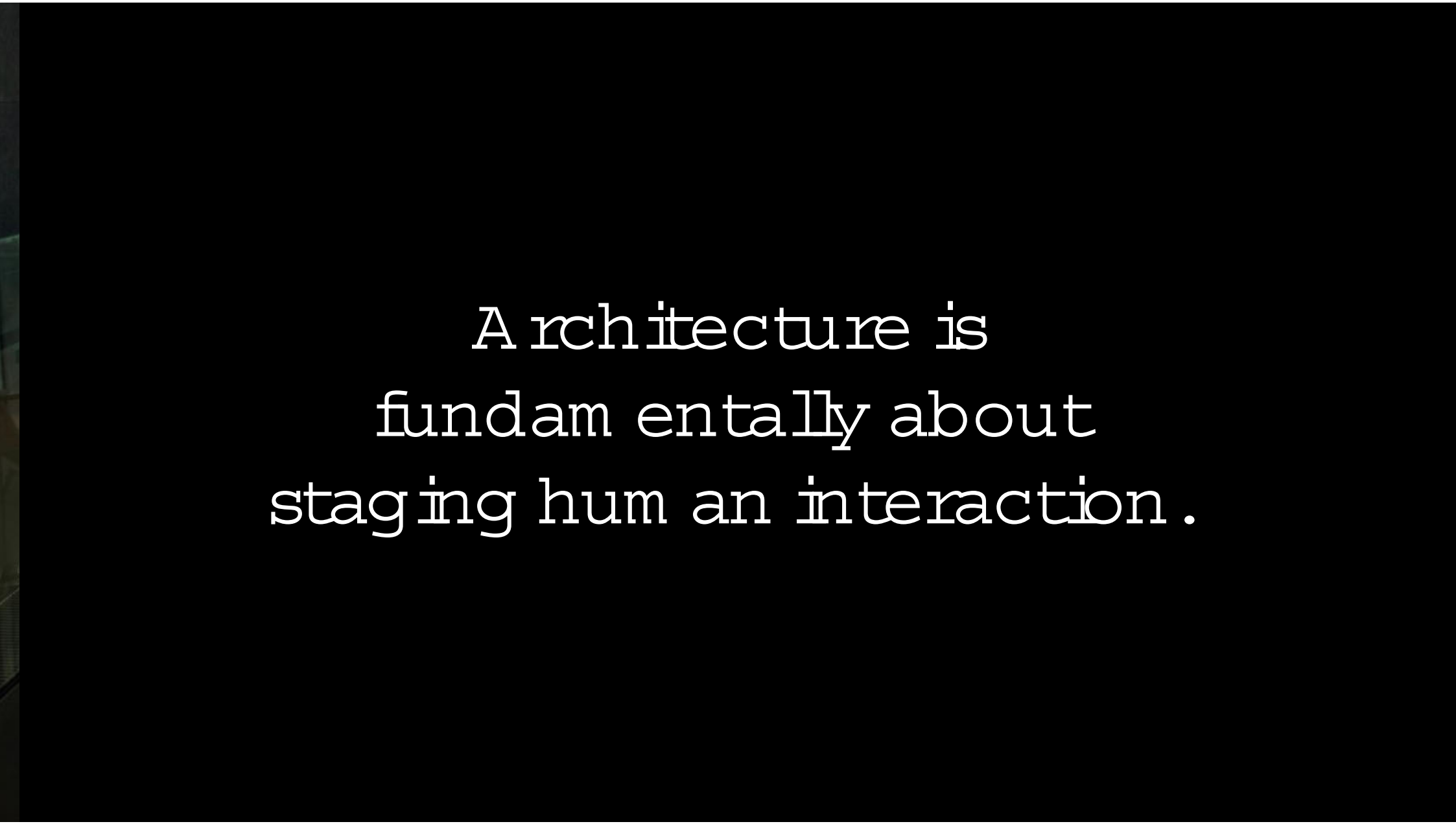
The Architect as the Conductor

Photo via www.trabbokalde

Elbphilharmonie, Hamburg, Germany
by Herzog & de Meuron

Wicked Problems

Workshop, Copenhagen
Performing Arts Center World Trade Center


Architecture is
fundamentally about
staging human interaction.

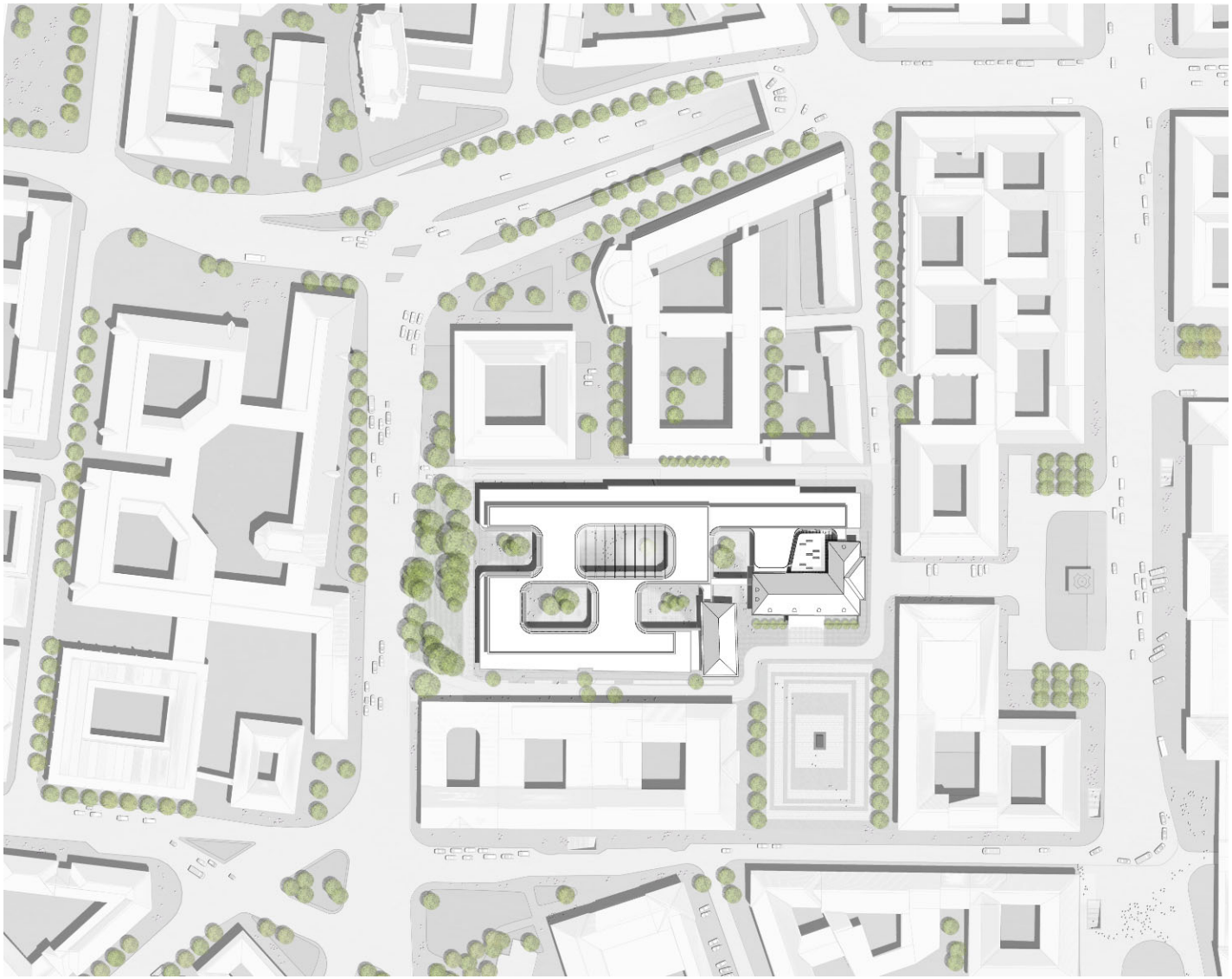
Munich, Germany

Siemens GlobalHQ

Identity
Historic link to Munich

Visibility
Sustainable frontrunner
in an urban context

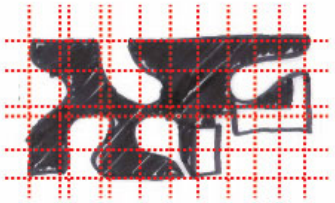
Urbanity
Modern and attractive
work place



Woven into the urban fabric

The site

Inviting the public in



Structural optimization

A series of green courtyards

3 different façade strategies

1: Discreet towards the protected Ludwig Ferdinand Palais

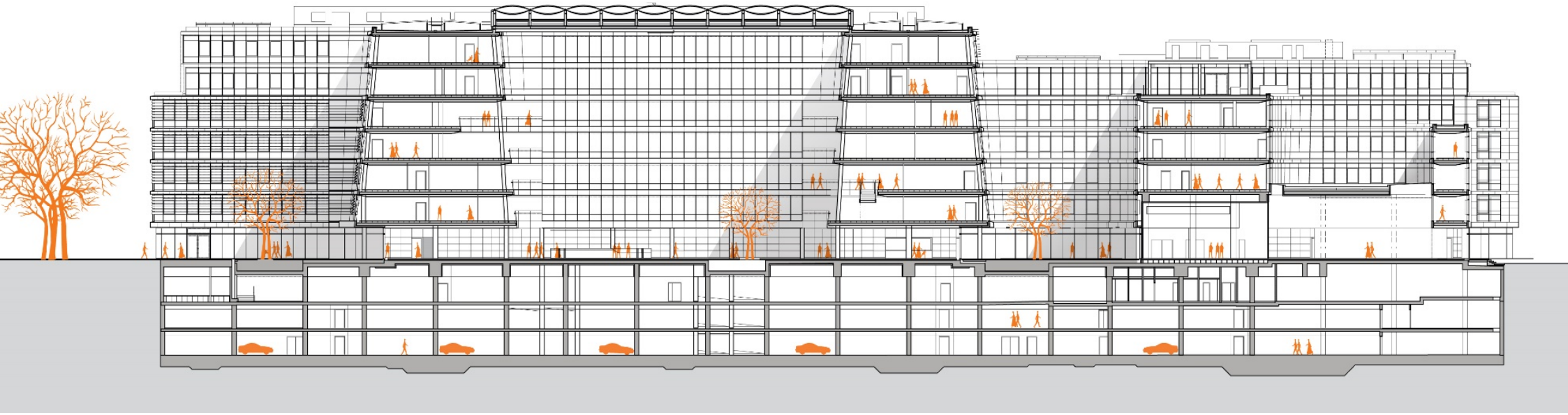
3 different façade strategies

2: Elegant and adaptable towards neighbourbuildings

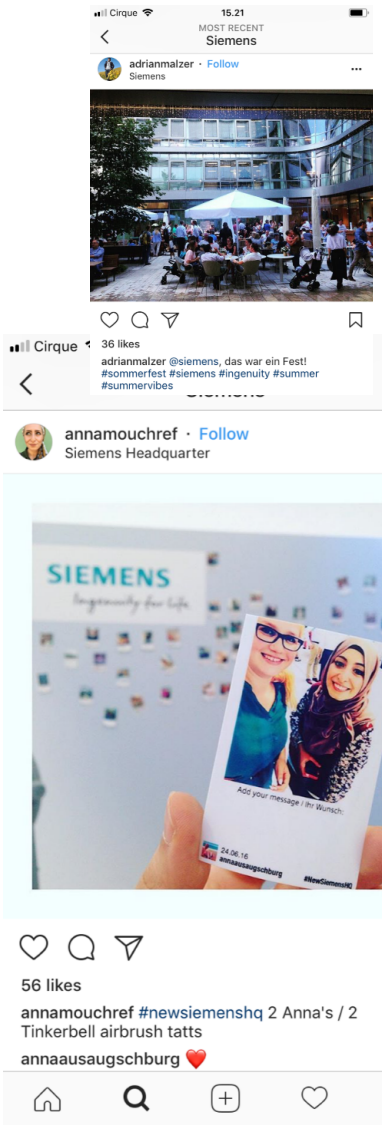
3 different façade strategies

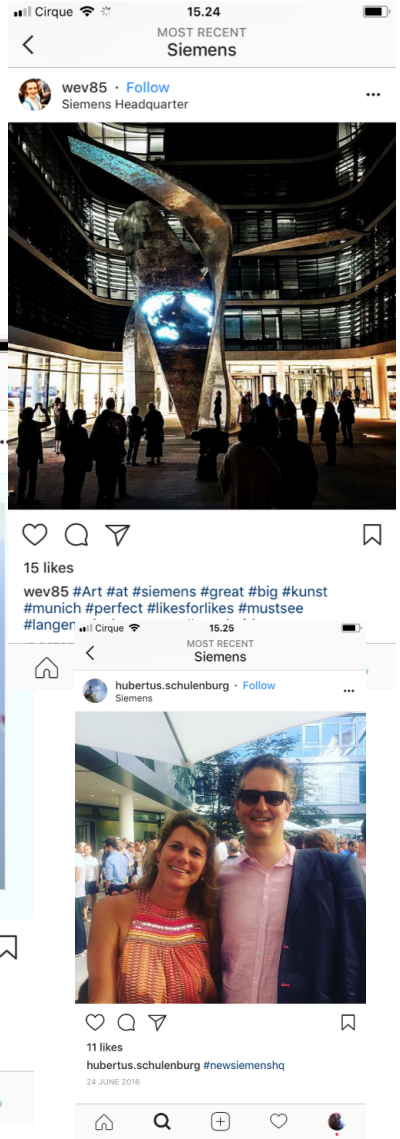
3: Significant and modern towards the heavy traffic

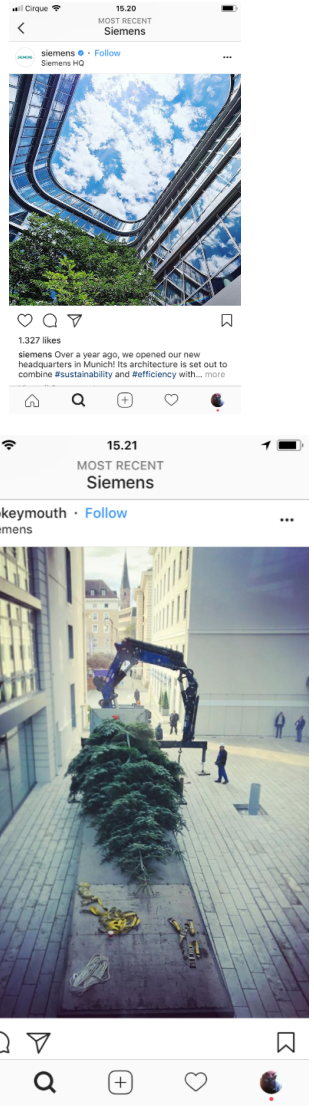
Sustainable by design
Tilted inner faced for inflow of daylight

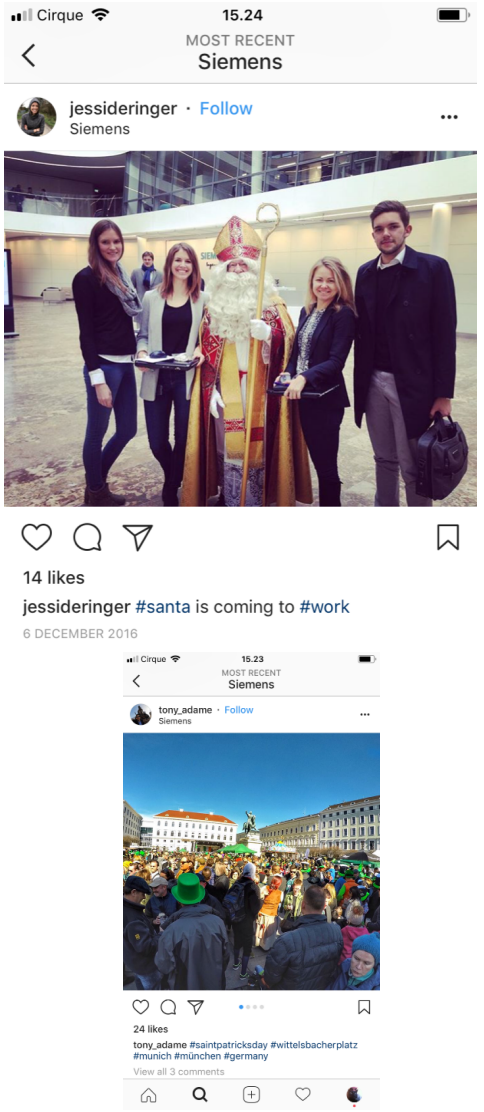


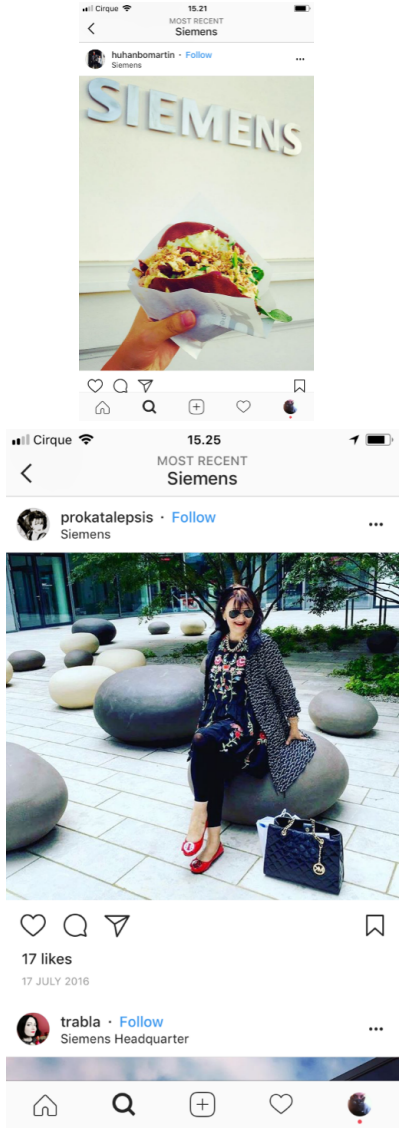
A socialcontribution to the city











Henning Larsen

INPUT

The questions we ask

Dreams
Visions
Goals
-
Data
Measurements

ARCHITECTURE

OUTPUT

The effect we create

Effect on the individual
Effect on the culture/city
Effect on the environment

Research

Energy and Buildings

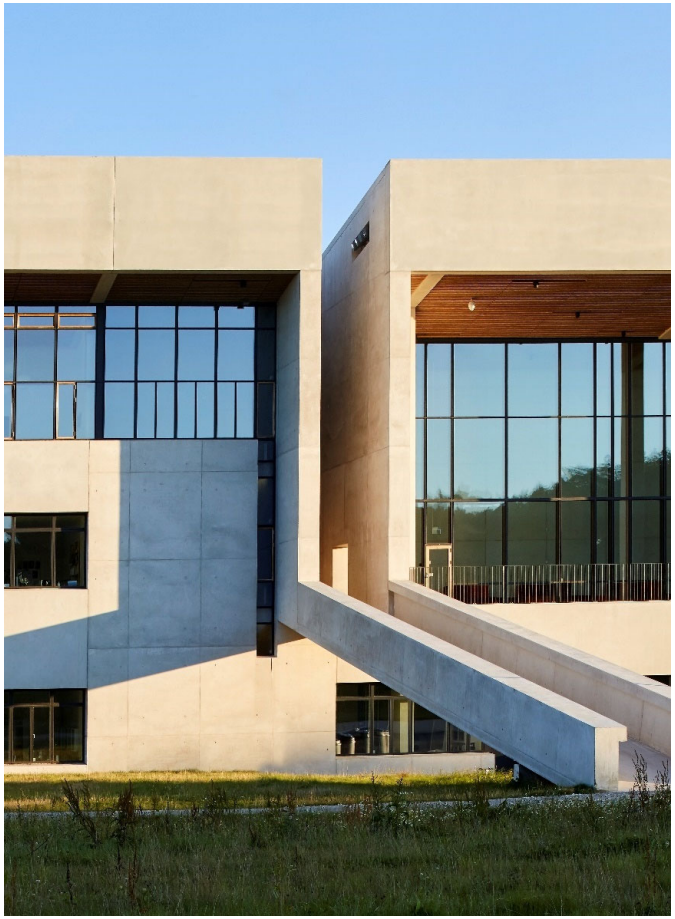
The urban canyon and building energy use: Urban density versus daylight and passive solar gains

J. Strømann-Andersen, P.A. Sattrup

1. Introduction

Research

Design methods



Projects

Why do we do research?

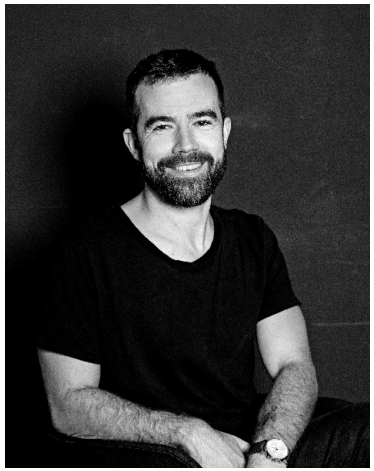
Because we seek solutions that validate our architecture and create the best possible conditions for the users in our buildings and cities.

It's not about how buildings and cities look, but what they can do.

In-house Industrial PhDs Programs

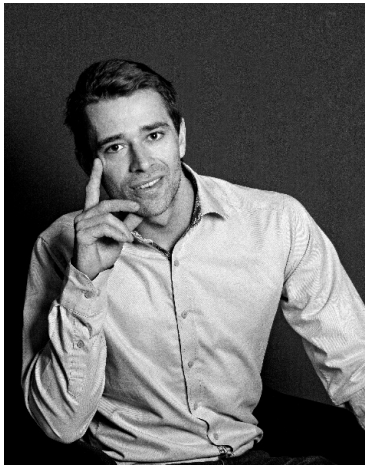
Imke Wies van Mils

PhD. Stud. Artificial Lighting



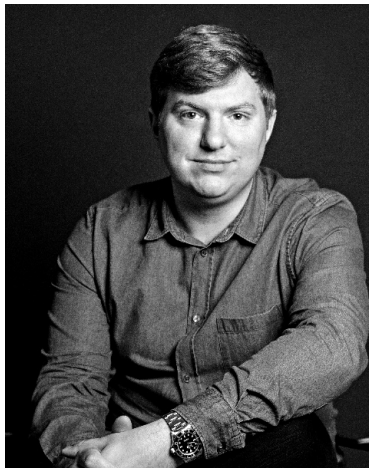
Pelle Munch-Petersen

PhD. Stud. Facade Design, Architects



Krister Jens

PhD. Stud. Big Data



Drew Thilmany

Phd. Stud. Ethnology, M A Applied Cultural Analysis

Finnur Pind

Phd. Stud. Acoustics, M Sc. Civil Engineer

Cases

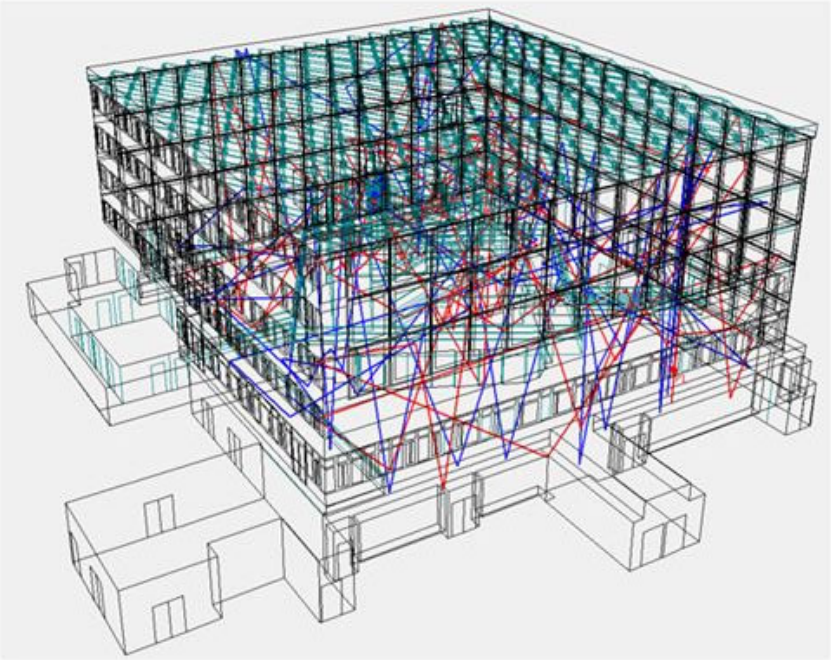
Uppsala, Sweden

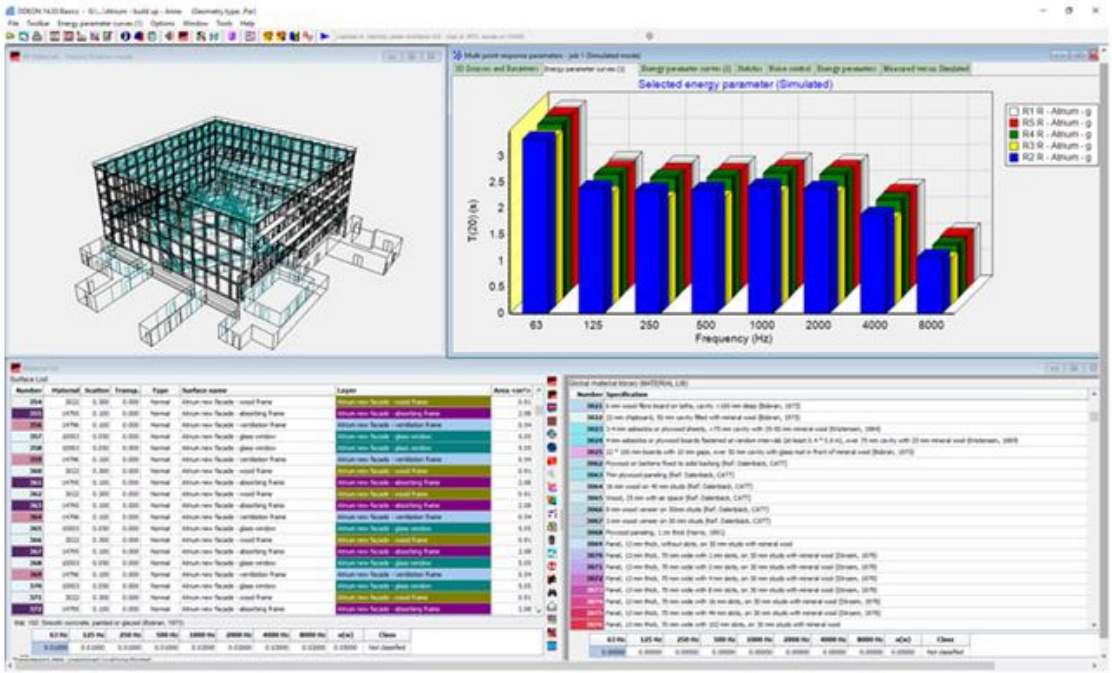
Uppsala City Hall


UPPSALA KOMMUN

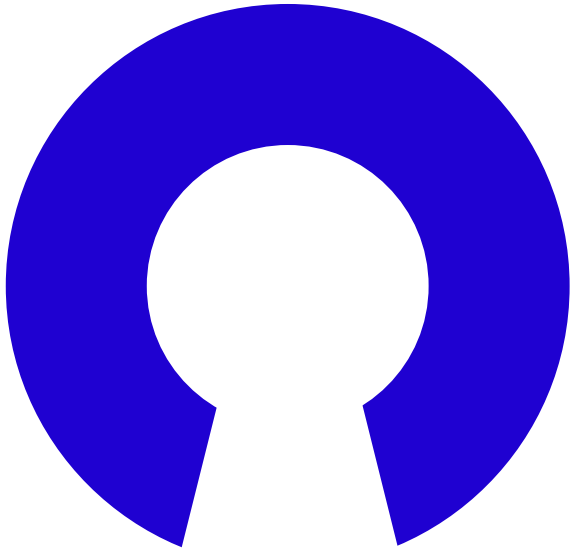
Uppsala City Hall

Research virtualacoustics

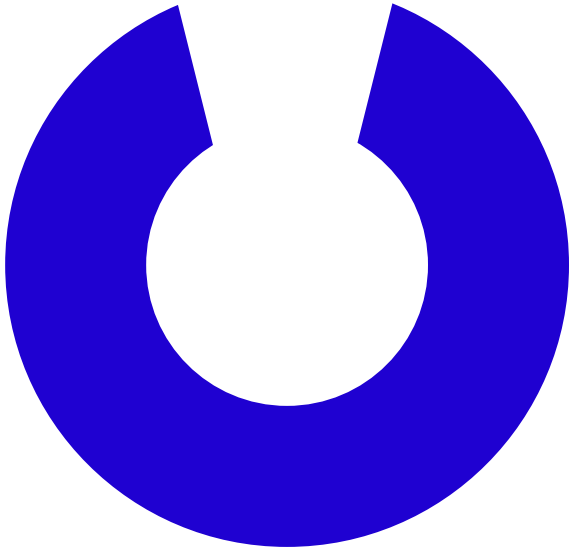




Research virtual acoustics



VS



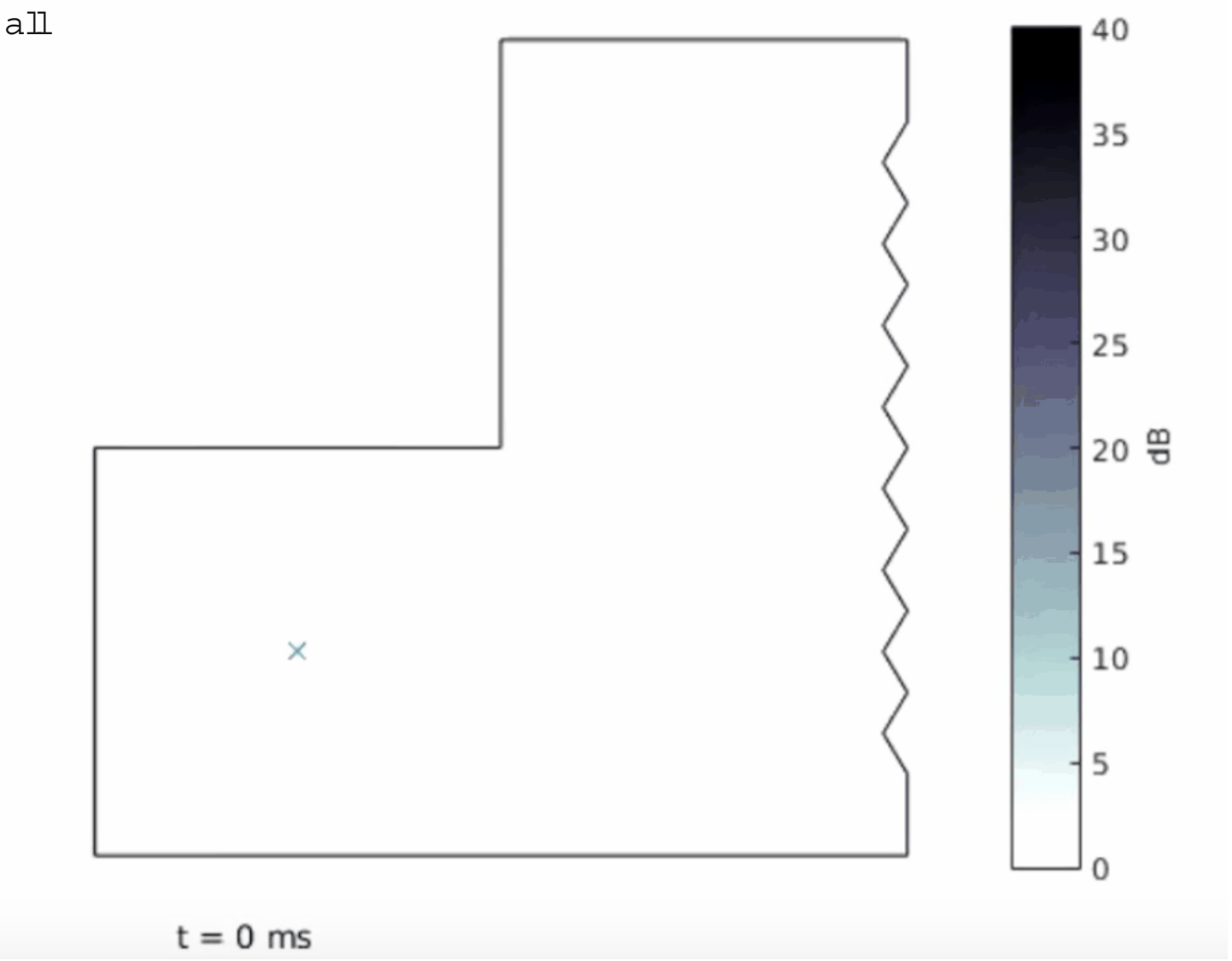
closed source

open source

Uppsala City Hall

Combining technologies

Uppsala City Hall



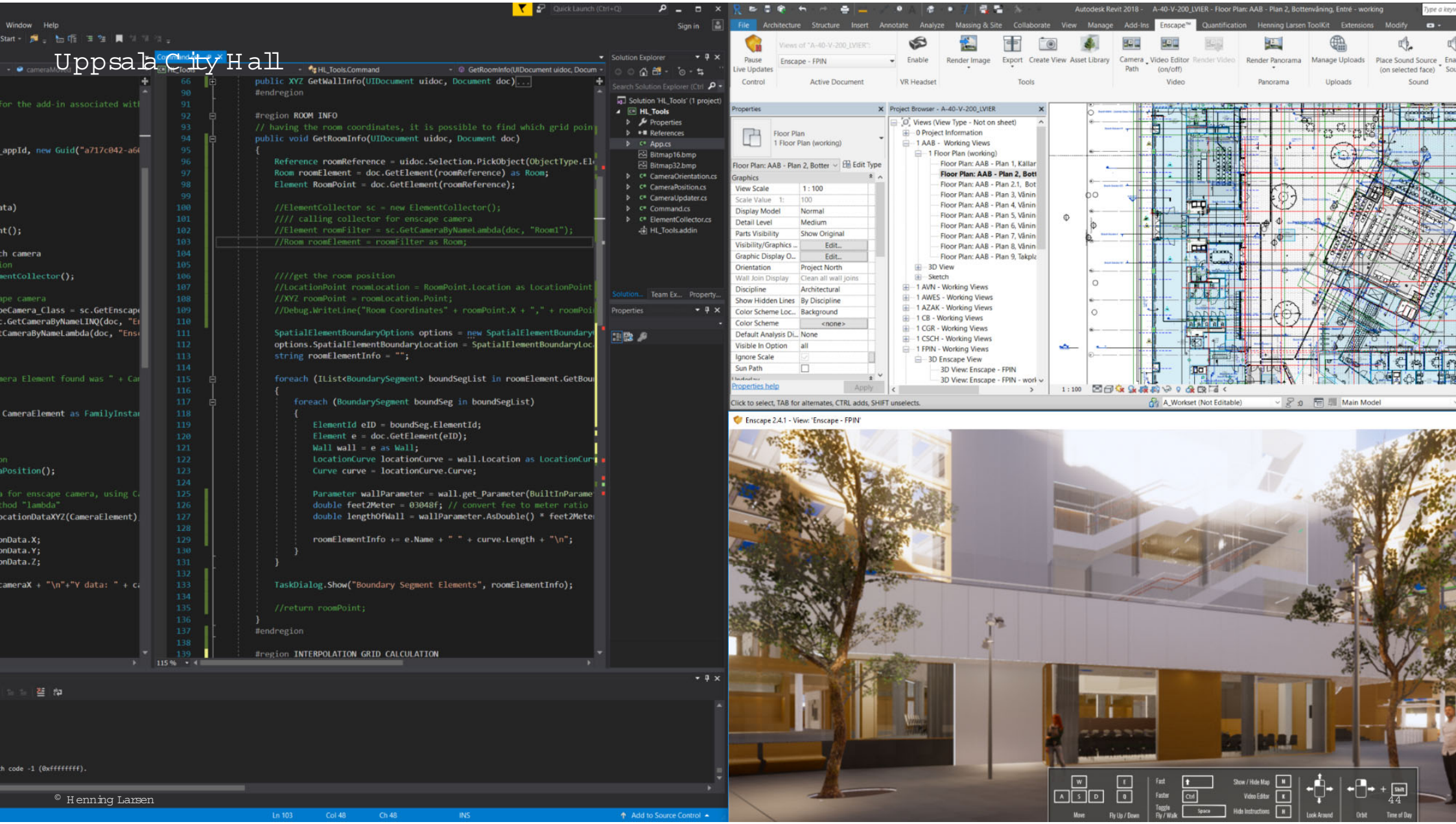
Uppsala City Hall

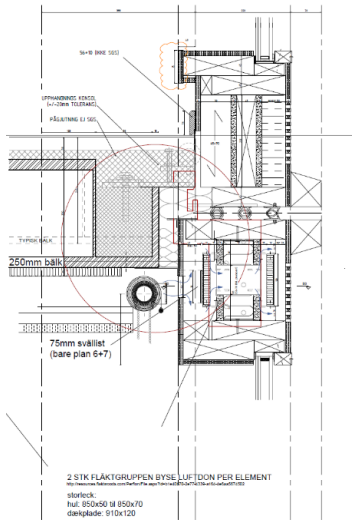
Virtual soundscapes and immersive audio

– new technologies to engage the user

Uppsala City Hall
Atrium
Virtual Acoustics

Uppsala City Hall



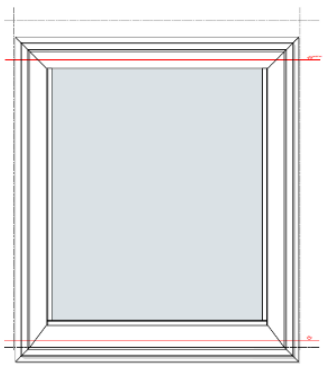


2 STK FLÆKTGRUPPEN BYSE LUFTDON PER ELEMENT

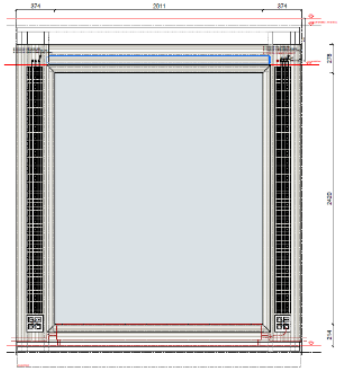
slotteck:
hul: 850x50 til 850x70
dækplade: 910x120

luftflöde per luftdon: 70 l/s @ 15Pa*
*Luftflöden kommer ned, når man kombinerer med perforeret faner + stomme.

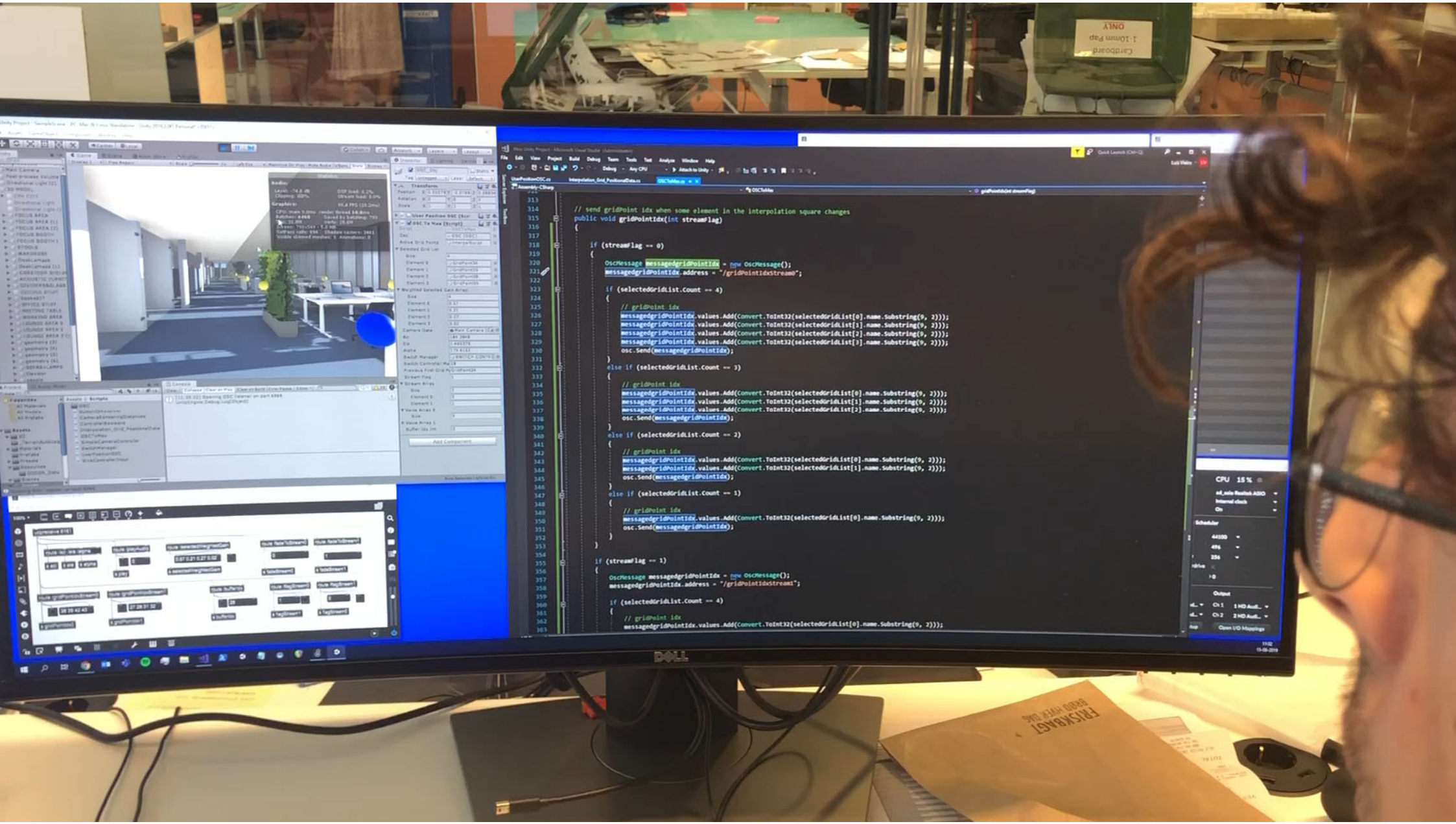
Reduktionstal R2 i dB
Rw 40 ved montage i oplsvæg.



Gatafasaden - uppställning mot gata (plan 4, 5, 6)



Gatafasaden - uppställning mot kontor (plan 4, 5, 6)


// send gridPoint idx when some element in the interpolation square changes
public void gridPointIdx(int streamFlag)
{
if (streamFlag == 0)
{
OscMessage messagedgridPointIdx = new OscMessage();
messagedgridPointIdx.address = "/gridPointIdxstream0";
if (selectedGridList.Count == 4)
{
// gridPoint idx
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[0].name.Substring(9, 2)));
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[1].name.Substring(9, 2)));
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[2].name.Substring(9, 2)));
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[3].name.Substring(9, 2)));
osc.Send(messagedgridPointIdx);
}
else if (selectedGridList.Count == 3)
{
// gridPoint idx
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[0].name.Substring(9, 2)));
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[1].name.Substring(9, 2)));
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[2].name.Substring(9, 2)));
osc.Send(messagedgridPointIdx);
}
else if (selectedGridList.Count == 2)
{
// gridPoint idx
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[0].name.Substring(9, 2)));
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[1].name.Substring(9, 2)));
osc.Send(messagedgridPointIdx);
}
else if (selectedGridList.Count == 1)
{
// gridPoint idx
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[0].name.Substring(9, 2)));
osc.Send(messagedgridPointIdx);
}
}
if (streamFlag == 1)
{
OscMessage messagedgridPointIdx = new OscMessage();
messagedgridPointIdx.address = "/gridPointIdxstream1";
if (selectedGridList.Count == 4)
{
// gridPoint idx
messagedgridPointIdx.values.Add(Convert.ToInt32(selectedGridList[0].name.Substring(9, 2)));
CPU 15 %
DELL

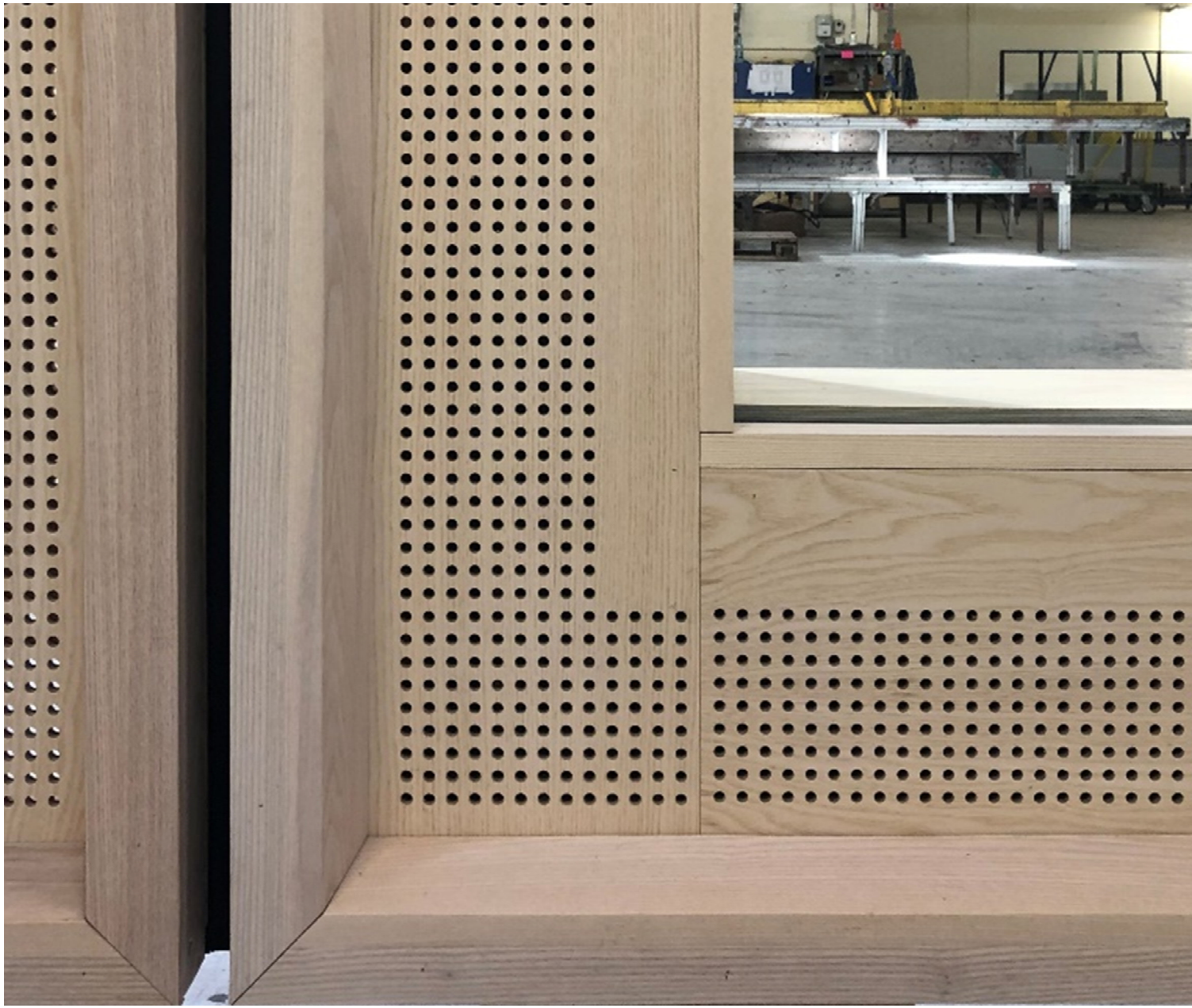
Uppsala City Hall

Outcome on KPI's and awards

New window DFD and acoustic absorptions integrated

Higher performance, less materials and reduced construction cost

New software in virtual acoustics simulation



Aarhus, Denmark

Frederiksbjerg School


Henning
Larsen

Frederiksbjerg School

A new way of learning about...

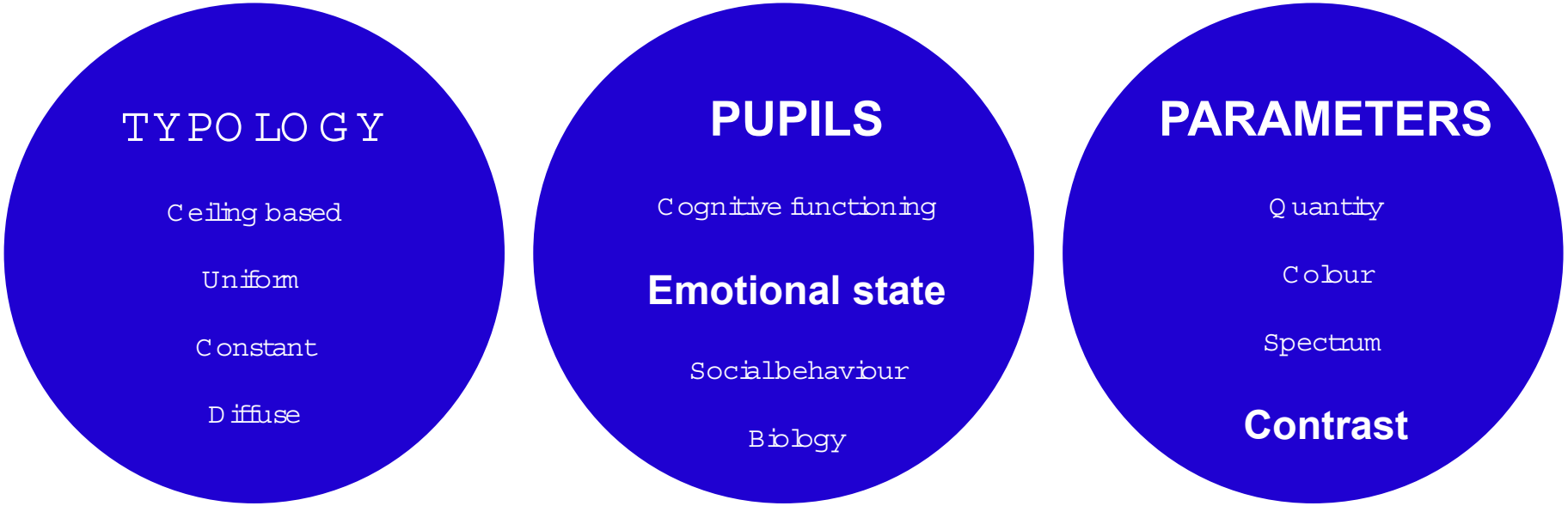
Traditional lecture-based learning...

Collaborative group work...

What kind of artificial lighting is present in learning environments?

How does artificial light influence user's of learning environments?

Which "characteristics" of artificial light are responsible for this?



Sources: Flynn (1973, 1977, 1980), Collins et al (1975), Lõfberg et al (1975), Weinstein et al (1979), Smith & Rea (1980), Dunn et al (1985), Küller & Lindsten (1992), Hathaway (1995), Knez et al (1995, 1998, 2001), Rusak et al (1997), Kuller (1998), Heschong Mahone Group (1999), Veitch & McColl, (2001), Goven et al (2001), Boyce (2003, 2014), Winterbottom (2001), Van Bommel et al (2004), Wessolowski (2010), Goven et al (2011), Barkmann et al (2011, 2014), Sleegers et al (2012), Mott et al. (2014)

Henning Larsen

Frederiksbjerg School

Legislation / BR18

Det skal eftervises, at det elektriske belysningsanlæg opfylder bygningsreglementets krav for belysningsstyrke, jf. DS/EN 12464-1, *Lys og Belysning - Belysning ved arbejdspladser – Del 1: Indendørs arbejdspladser.*
For nogle arbejdspladser er kravene til belysningsstyrke yderligere specificeret i det nationale anneks DS/EN 12464-1 DK NA. Eksempler på krav til middelbelysningsstyrke og regelmæssighed er givet i tabel 3. Regelmæssigheden af belysningen, U0, defineres som minimums belysningsstyrken, E_{min}, i forhold til middelbelysningsstyrken, E_{mid}.

De tekniske krav til belysningen skal kunne opfyldes i hele anlæggets levetid.

Tabel 3. Eksempler på krav til belysningsstyrke ved udvalgte arbejdspladser, jf. DS/EN 12464-1 og DS/EN 12464-1 DK NA.

Sted	*Middelbelysningsstyrke på ar-bejdsplanet, E_{mid}*	*Regelmæssighed, U_0*
Gange og trapper	*100 lux*	*0,40*
Kontorarbejde *- Opgaveområde (på synsobjektet)* *- I nærområdet (over ½ m fra synsobjektet)*	 *500 lux* *300 lux*	 *0,60* *0,40*
Børnehaver og vuggestuer	*300 lux*	*0,40* *0,60 (koncentrationsleg)*
Undervisningslokaler	*300 lux*	*0,6*

AARHUS UNIVERSITET

DANMARKS PÆDAGOGISKE UNIVERSITETSSKOLE
AARHUS UNIVERSITET

DTU Danmarks Tekniske Universitet

ELFORSK

Combining the audio and visual human experience

New Research in Light, Acoustics and Learning

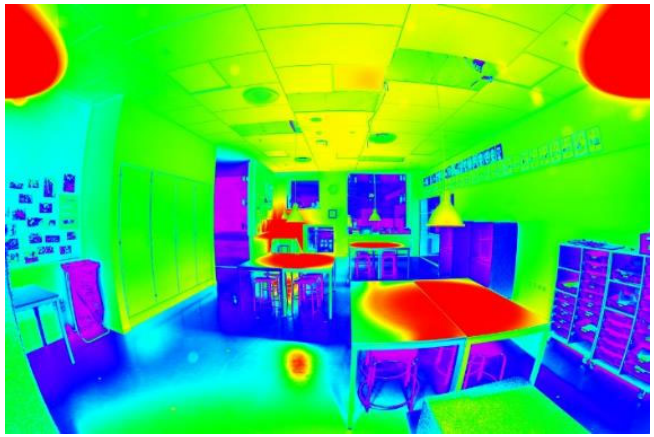
Experimenting with mood lighting

Normal

Ambient Lighting

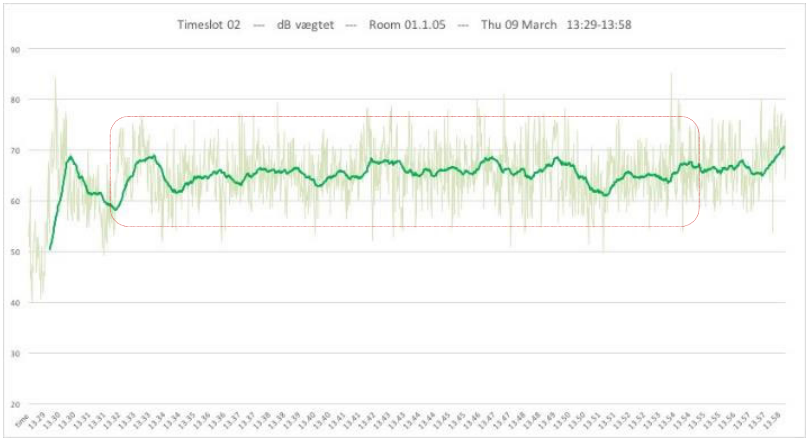
Experiment

Focused lighting

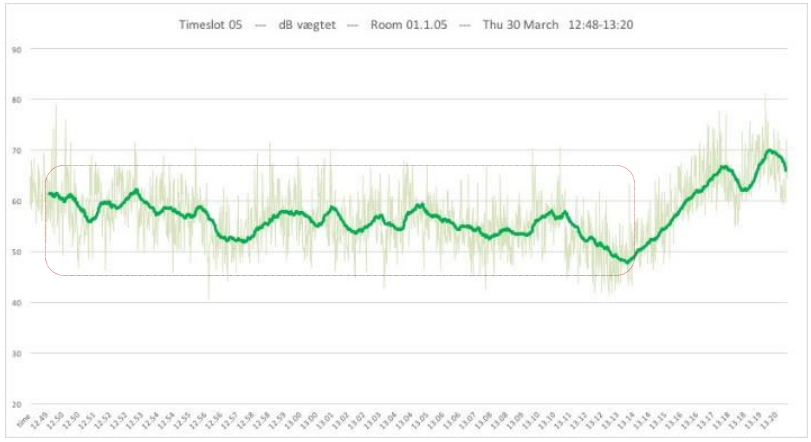


Focused light

Default, traditional ceiling lighting (video snapshot)



Pendant lighting activated (video snapshot)



Findings:

Our data shows an average reduction of 2-8 dB

- 1 dB: Noticeable with special equipment in a soundproof room
- 2-3 dB: Noticeable in an 'average environment' (though perhaps only when asked)
- **4-6 dB: Very noticeable in an average environment (students will hear the difference)**
- 7-8 dB: Significant, a noteworthy reduction
- 10 dB: 50 percent reduction, extremely audible

64 dB

58 dB

64 dB

58 dB

End results:

- Calm for students
- More comfortable
- Lowered electricity use (35% reduction)
- Less noise, on average -8 dB(A)

Aarhus, Denmark

Outcome on KPI's and awards

Calm for students

More comfortable

Lowered electricity use (35% reduction)

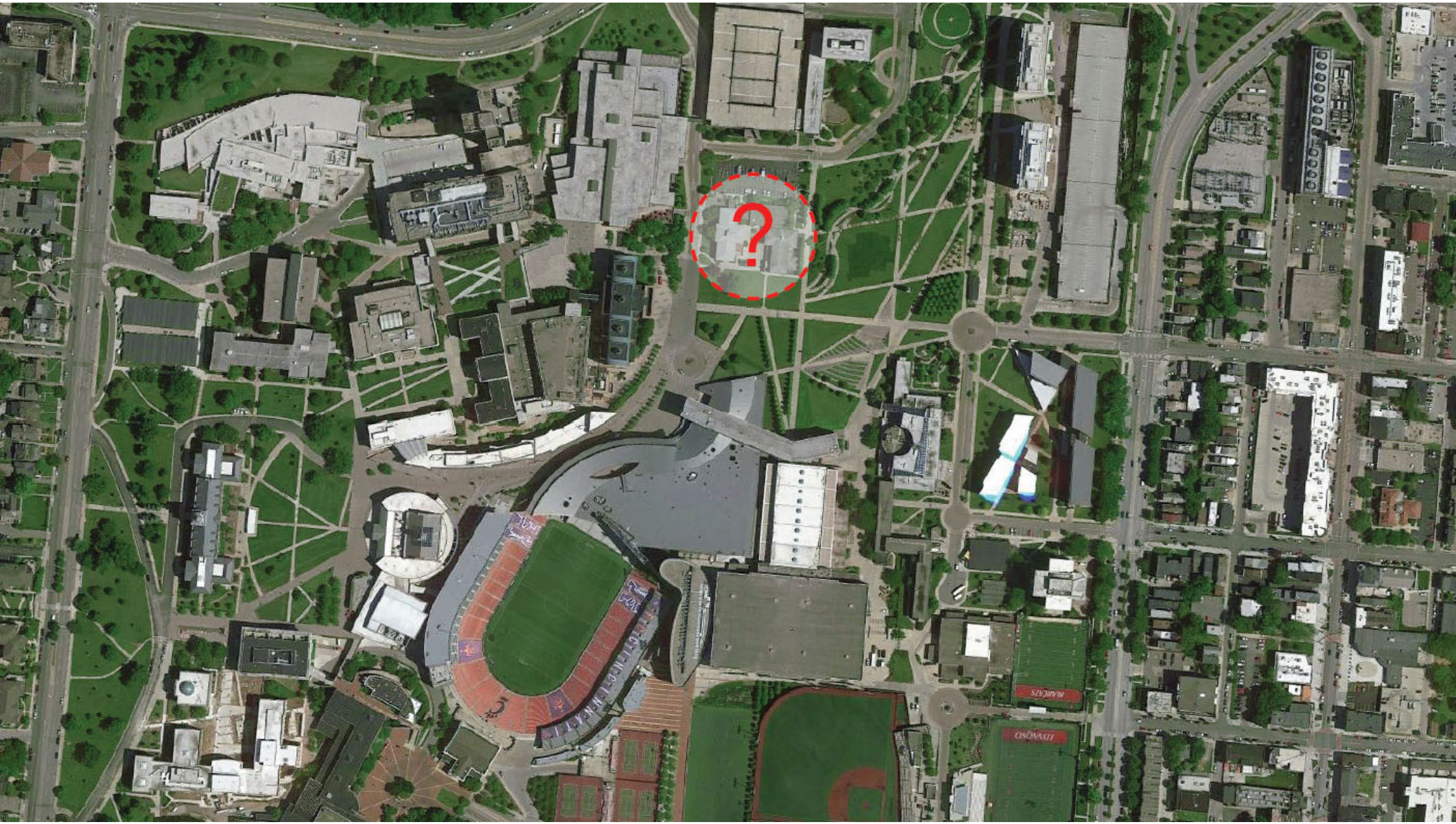
Less noise, on average -8 dB(A)

Carl H. Lindner College of Business

Location
Cincinnati, Ohio, USA

Gross floor area
22,500 sqm

Status
Under opførelse



Young adults are the loneliest generation in America.

Source: cna

Lonely millennials twice as likely to experience depression or anxiety

29.3% of UC students felt so depressed that it was difficult to function. (2016)

STUDENT WELLNESS CENTER

University of CINCINNATI


First design idea
-Scandinavian approach to
inclusivity

"You don't know what inclusivity means to us."

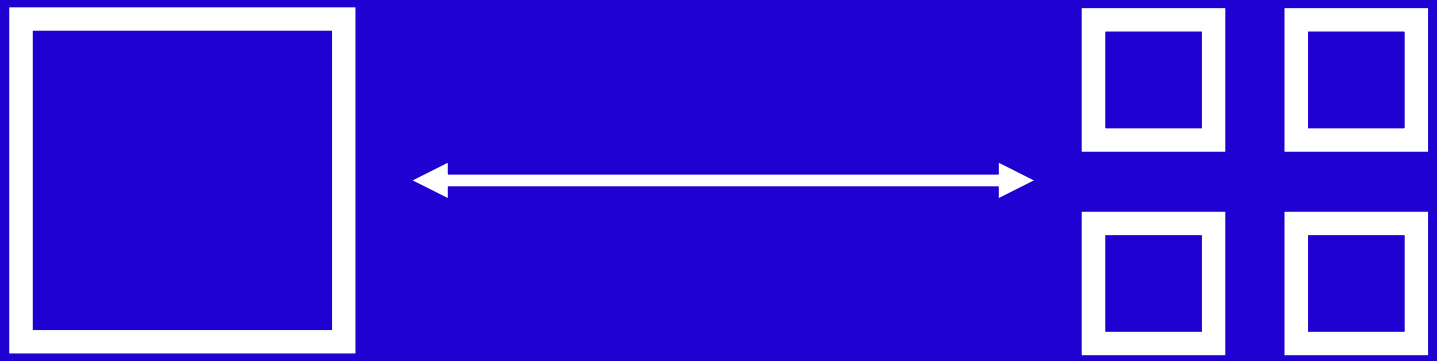
David Szymanski
Dean, Lindner College of Business
University of Cincinnati

"How can we ensure new kinds of environments don't become empty, unused spaces?"

Drew Thilmany, Henning Larsen

Ph.d. stud., Anthropology

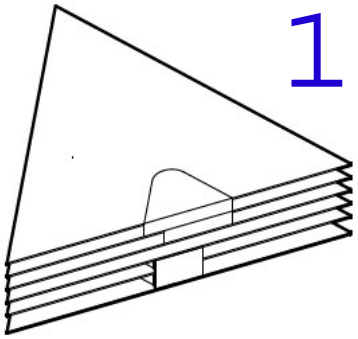
Inclusivity has a scale



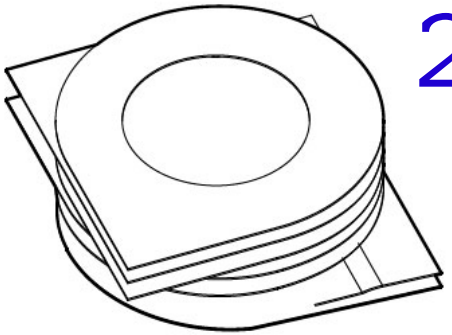
Anonymity (DK)

Recognition (US)

Design development



1



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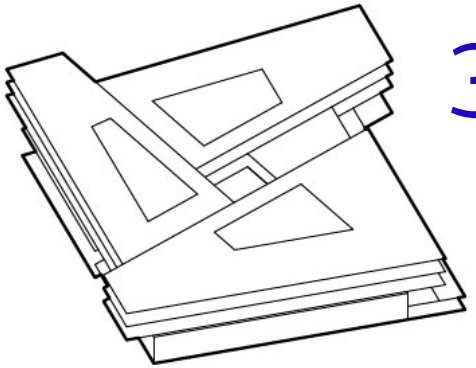
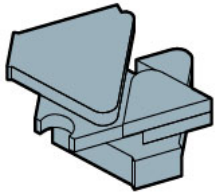
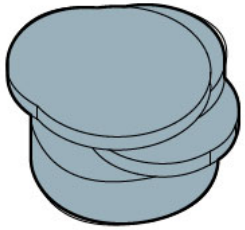
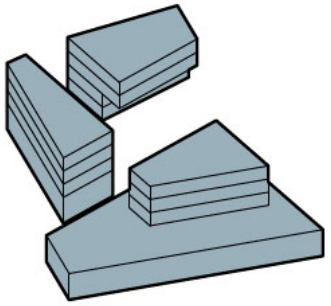


3








Turner
University of
CINCINN

How can we document the effect?

Transforming the circulation spaces into social interaction spaces

Before

vs.

Future

CIRCULATION SPACES
OLD VERSUS NEW

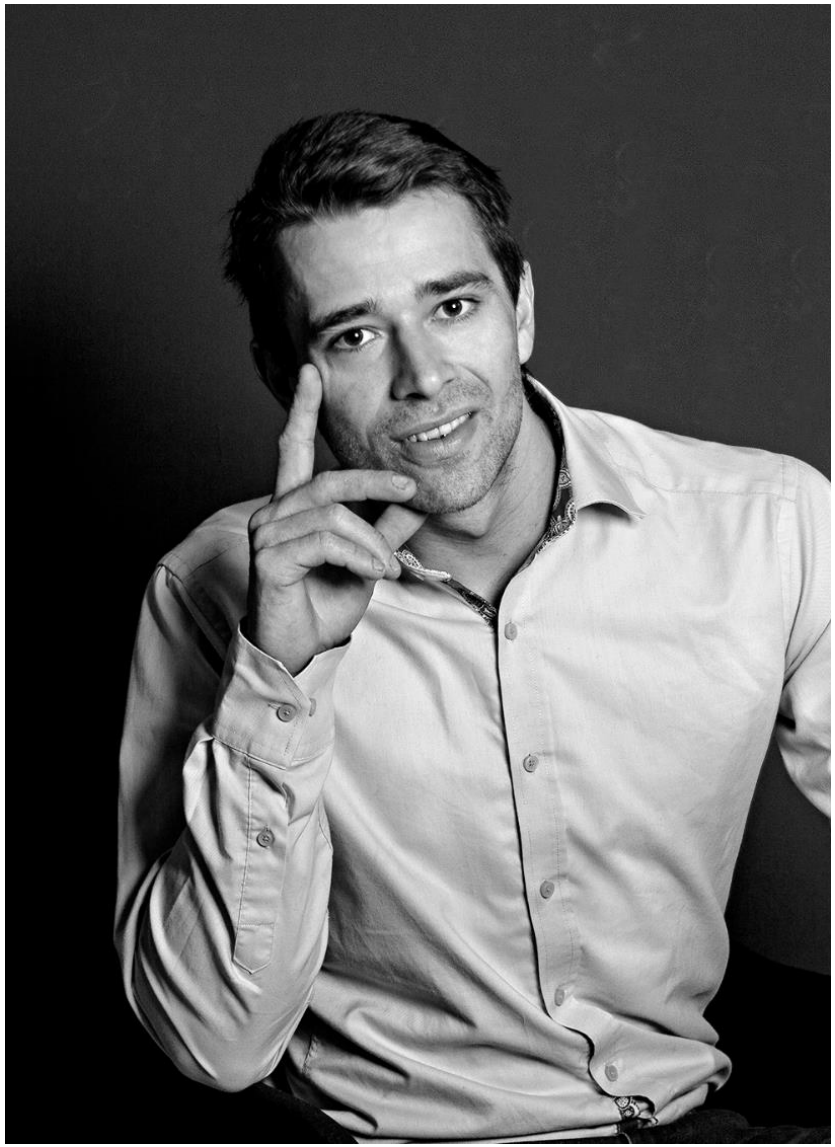
OLD BUILDING → NEW BUILDING

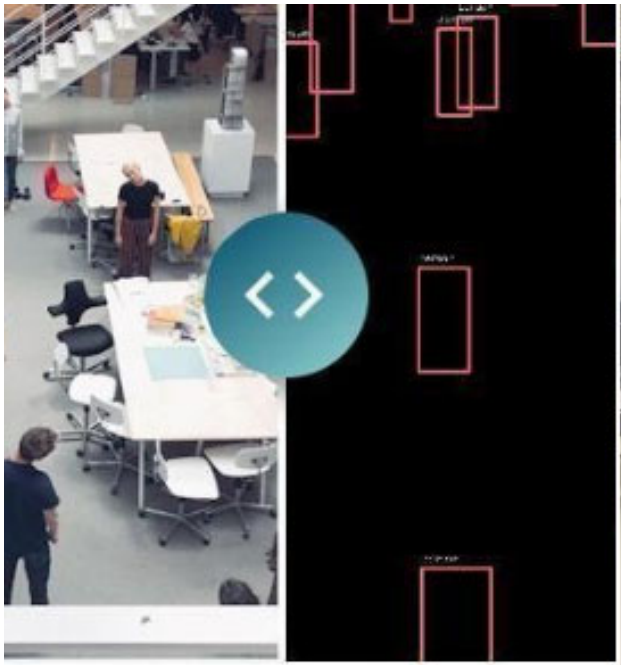
18% OF ENTIRE BUILDING

OF WHICH
60% ARE PUBLICLY ACCESSIBLE

25% OF ENTIRE BUILDING

OF WHICH
73% ARE PUBLICLY ACCESSIBLE






54.1
HOLD
Hagner
ScreenMaster
OVIS

Where do we measure?

Building Typologies
- Functions and intended designs

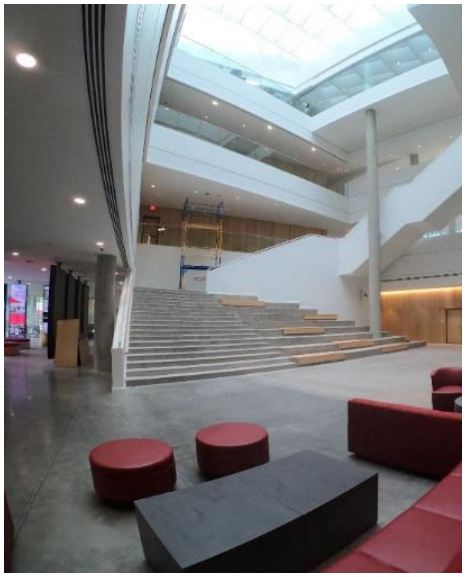
Physical Environment
- Layout and ratios
- Design elements

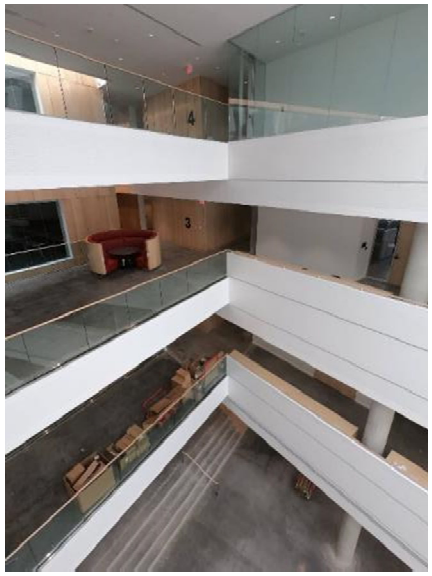
Flows & Occupancy
- Behvioral patterns

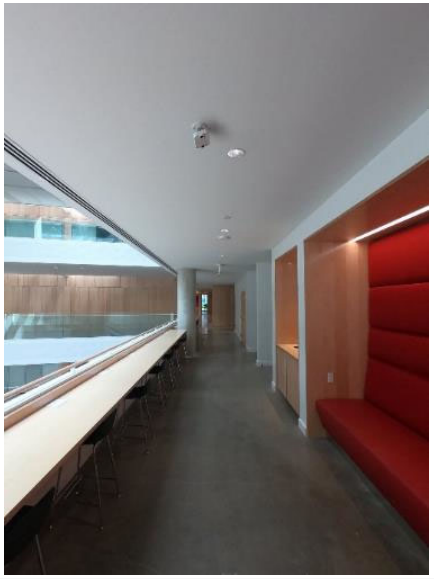
Indoor Climate
- Noise and Light
- Temperature

Usage & Activities
- Optional vs. necessary

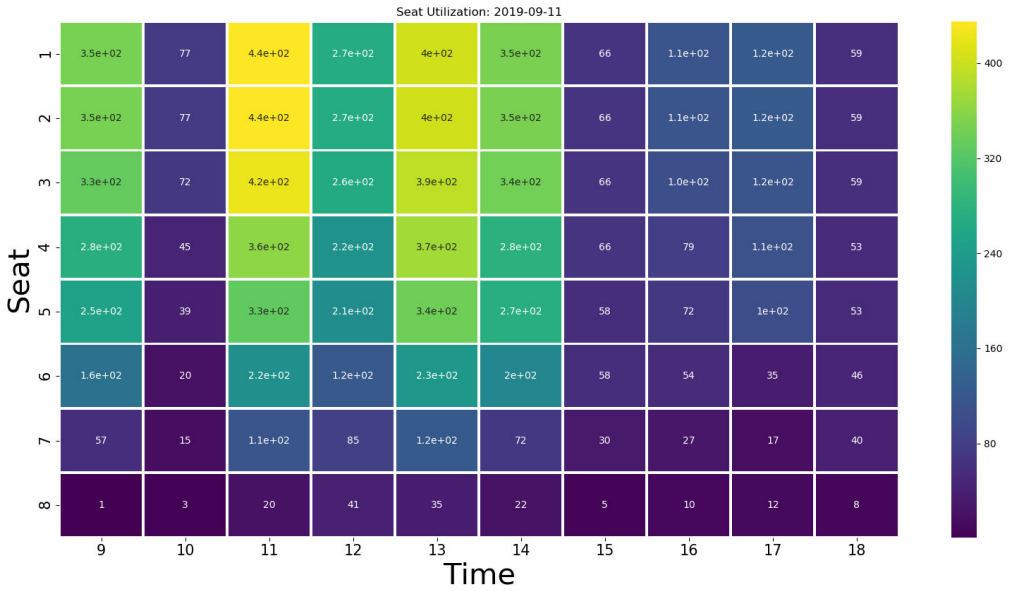
Where do we measure?



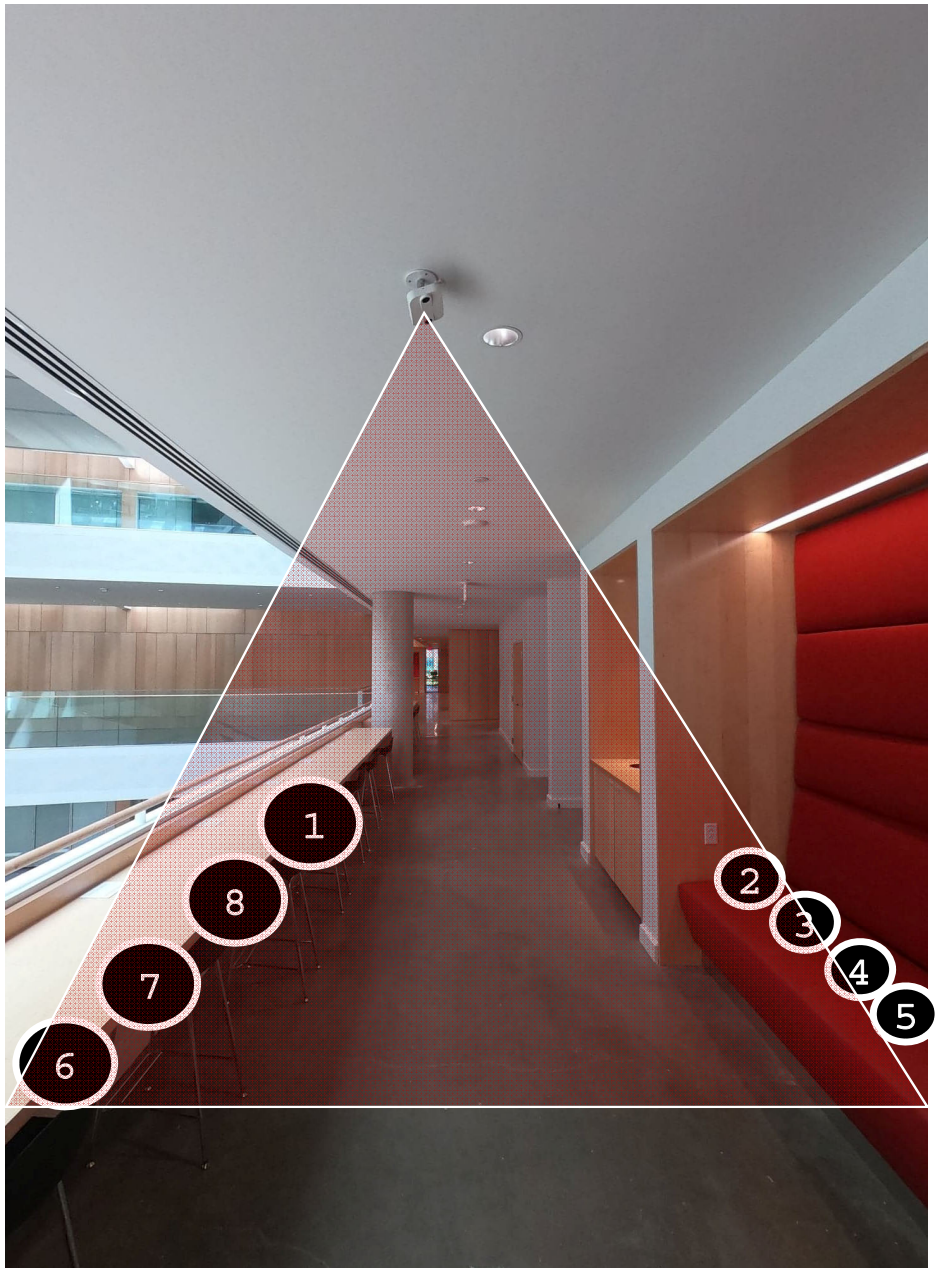




WALL AND WORK
SEAT-UTILIZATION IN TIME



PEAK HOURS ONLY IN THE MORNINGS / EARLY AFTERNOONS



OCCUPANCY DURATION

RETENTION CAPABILITIES BY BUILDING / FURNITURE TYPE

ROUNDTABLE

X MINUTES *(to be confirmed)*

Dominant Groupsize:
Medium

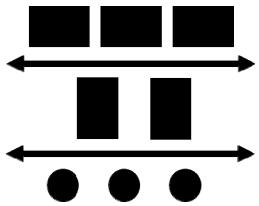
Duration: ????
Activity: Concentration
Group Types: Pair and Group (3)
Occupancy type: ???

WALL AND WORK

192 MINUTES

Dominant Groupsize:
Small

Duration: LONG
Activity: Concentration
Group Types: Individual and Pair
Occupancy type: Steady

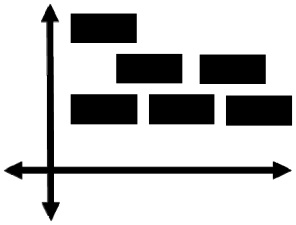


CAFETERIA EXTENSION

20.3 MINUTES

Dominant Groupsize:
Medium to Large

Duration: MEDIUM
Activity Type: Recreation/Work
Group Types: Group (3,4,5)
Occupancy type: Rythmic



ATRIUM

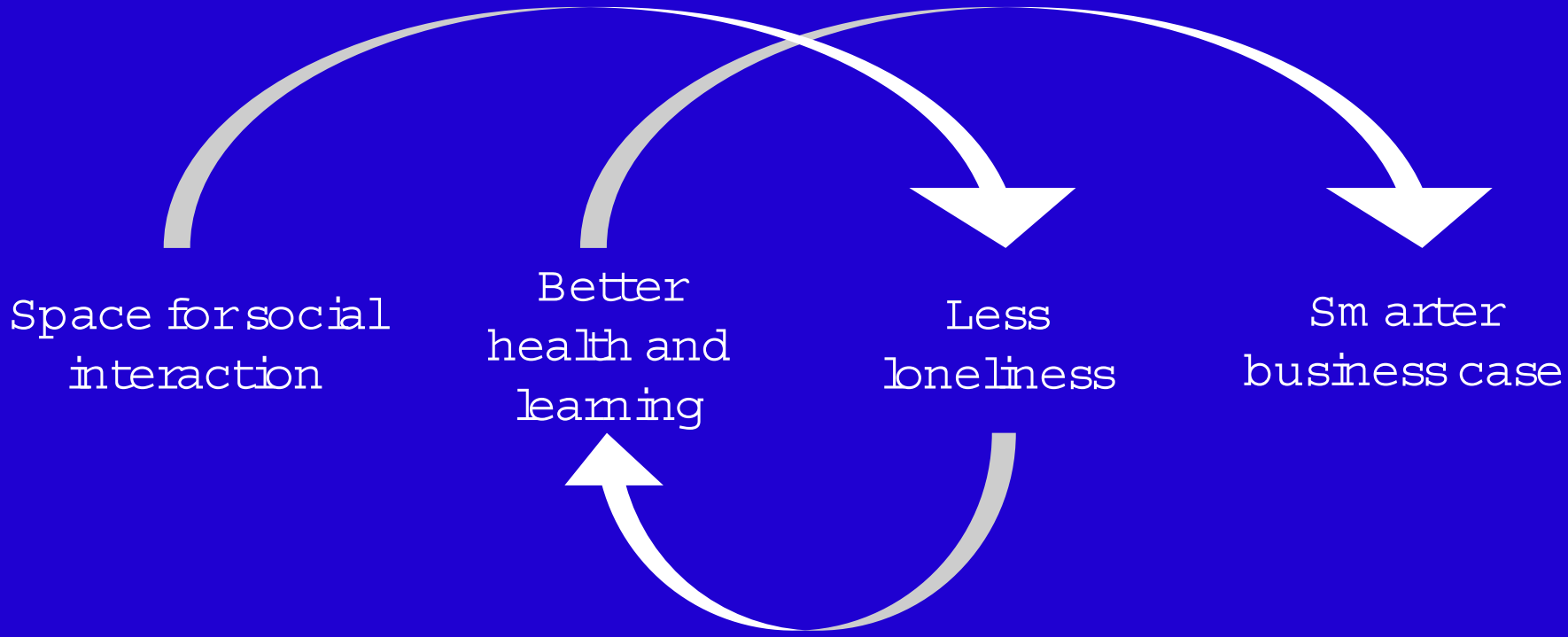
8.7 MINUTES

Dominant Groupsize:
Small to Medium

Duration: SHORT
Activity Type: Waiting
Group types: Individual and Pair
Occupancy type: Rythmic

UP NEXT:

- Deeper use and activity analysis of the functions
- Behavior and Wellbeing; stress levels
- Correlations to Physical Design and Circulation Flows
- Starbucks Sales Data
- Crime and Traffic
- Dropout rates
- Value propositions; open and enclosed spaces



"We shape our buildings and afterwards our buildings shape us."

Winston Churchill

Henning Larsen

Thank you

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