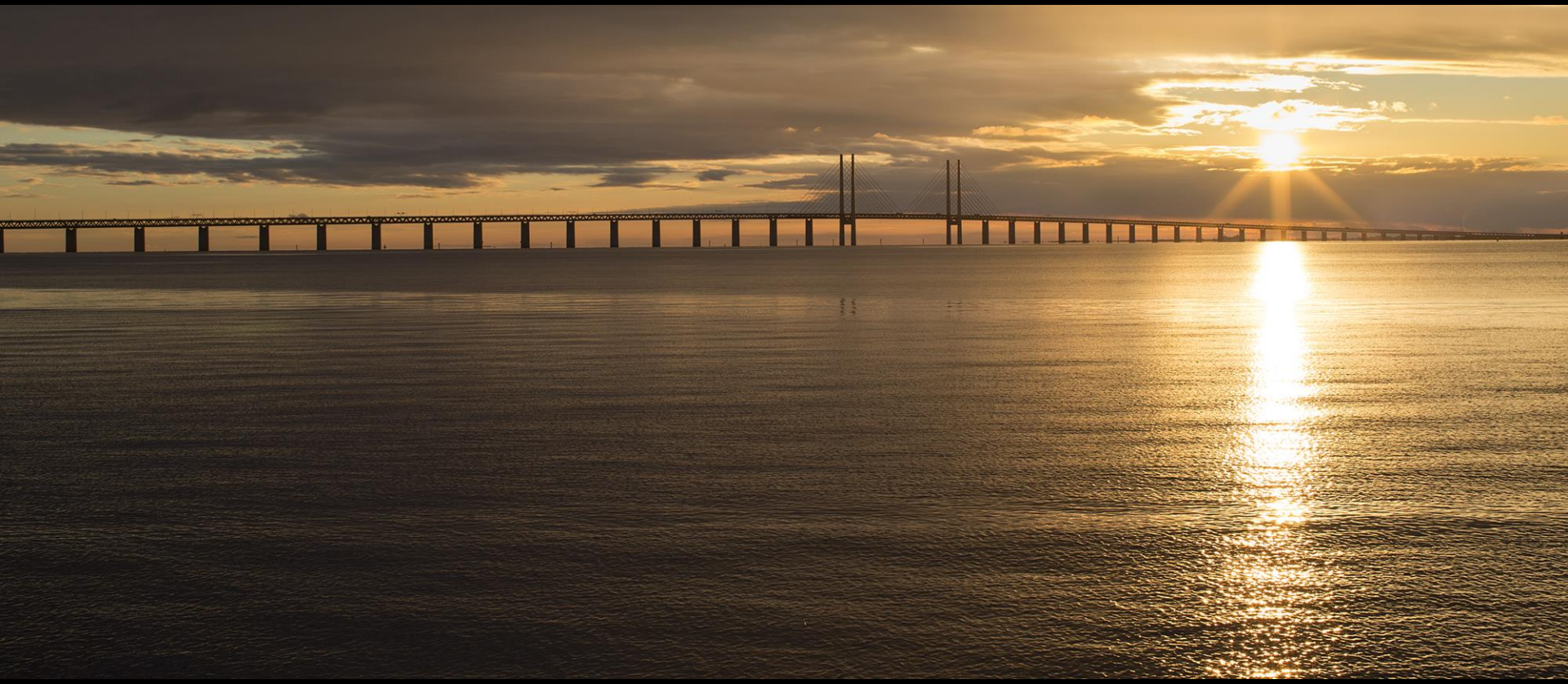
The Schools of the future



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149 600 000

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7 000 000

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136

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Conclusion

The human eyes is developed for the sun, not for lightbulbs

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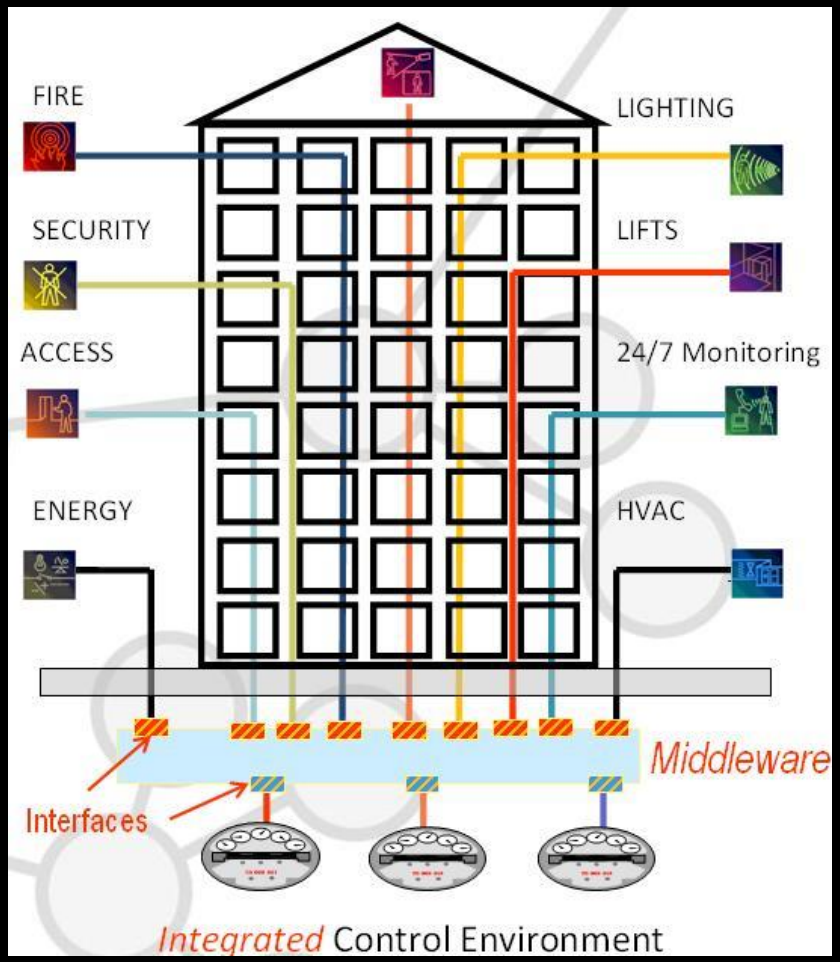
Olle Strandberg
Developer
Department of internal services

City of Malmö

How it all started



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Human Centric Lighting

- Biological effective lighting
- Circadisk rytm or body clock
- Blue light inhibits the melatonin in the body
- Blue light is activating (even in the night)
- To much blue light, or under to long time makes us stressful
- The natural light varies during the day
- Now we can copy that light for indoors purpose

- Besides, the flickering light of today, is no god

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Market analyze (may 2015)

- 5 companies in 5 different industries
  - Developing company (close to research)
  - HVAC- company
  - Electronic company
  - Trad. Lighting company
  - Lighting company selling transportation of the sun indoors

Very traditional solutions.
No one could present a successful implementation in a school environment.

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1975

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New Lighting solution

- What is good LED?
- Where can we buy those?
- How will they communicate with stearing system?
- What stearing system is the best?
- Where to get the lighting schedule?
- What different scenarios do we need?
- How do we switch from different scenarios?
- What ramping time is adequate?
- Who can install?
- Who can maintain?
- What education is needed?

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The solution

- Tuneable white 60X60, 2700 – 6500 K, 3800 lm, Dali 2, from Candelux
- Crestron 5”- panel for switching scenarios
- Dali and Crestnet protocol
- Lighting schedule from LTH
- Colour temperature between 2700 K – 5800K
- Programed by Dep. of internal services
- Installed by Dep. of internal services
- Maintained by Dep. of internal services
- Education: We did the best we could!

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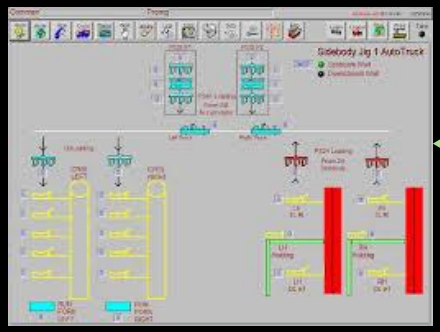
The solution



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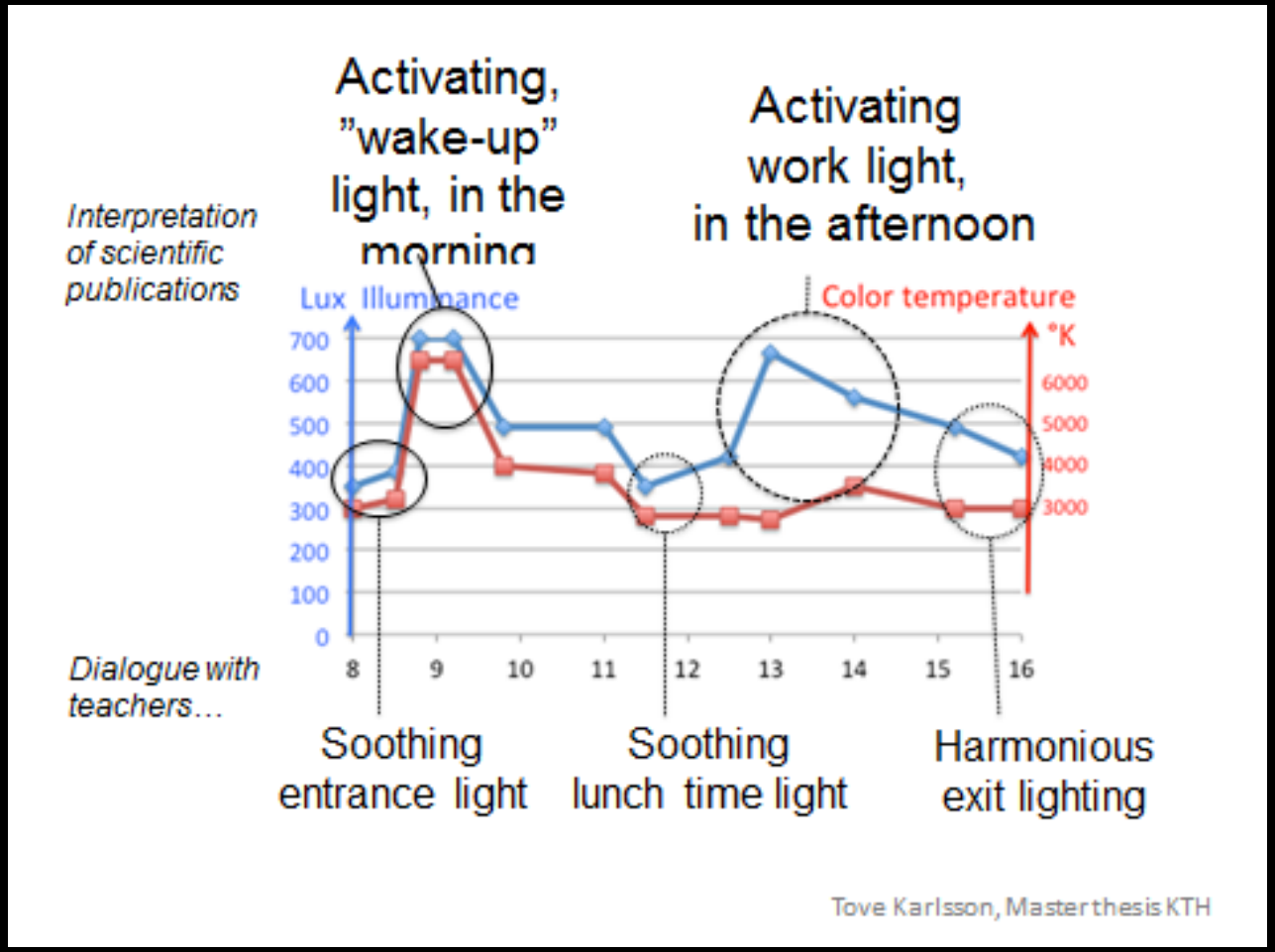
Lighting schedule



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Lighting schedule

Time	Intensity	CT
08:00	70 %	2700
08:40	100 %	6500
09:00	100 %	5000
11:00	70 %	4000
11:30	70 %	3000
12:00	70 %	2700
12:20	80 %	4000
13:00	90 %	5000
13:20	70 %	4000
14:00	70 %	3500
14:20	70 %	3500
14:50	70 %	3500
15:20	60 %	2700

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AUTOMATISKT
AKTIVERANDE
DIALOG
PRESENTATION
SMARTBOARD
NEUTRALT
STÄD
ALLT FRÅN
WHITEBOARD
RÖD
BLÅ
INT
CRESTRON

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Reactions from pupils

- Have we got roof light
- Much better
- We also want this
- You get less tired
- You loose focus in the yellow light
- During start up some pupils said they got headace

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Intial problems

- Ramping time was wrong in the beginning
- Some problems to control the colour temperature
- 400 Hz Flicker
- When changing scenarios the light made short dips to much lower intensity.
- Students were disturbed

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To think of!

- This is an IT-system, follow the IT-strategy
- There are many ways to make this happen, choose the one that results in the lowest maintenance
- It is possible that you can need to change the schedule in the future, it has to be easy to do that
- Education
- Maintenance and support
- Cleaning

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Why?

If we can help just one child to stay out of alienation

Then it´s worth it!

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City of Malmö