

# Campus of the future

smart tools and information to support strategic choices



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smart tools and information to support strategic choices

political conditions  
ambitions university  
agenda city



user demands  
health & safety  
functionality



Source: MazeMap, NTNU website

costs per m2  
total costs of ownership  
market value



architecture - location  
technical condition  
energy-efficiency

# TU Delft's Campus research team



Campus NL



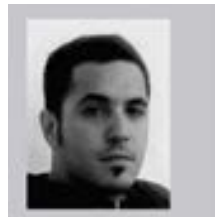
campuses, cities  
& innovation



sustainable  
campus



decision support



European campus

PhD circular BE / façade leasing



PhD Smart tools, smart buildings



management  
information

Guest  
researchers

Poland  
Estonia  
Norway  
Finland  
etc.



circular business  
models

university  
governance



8 MSc graduate students  
2018/2019

**Our mission:**  
to support campus  
decision-makers  
with new concepts,  
tools and  
information

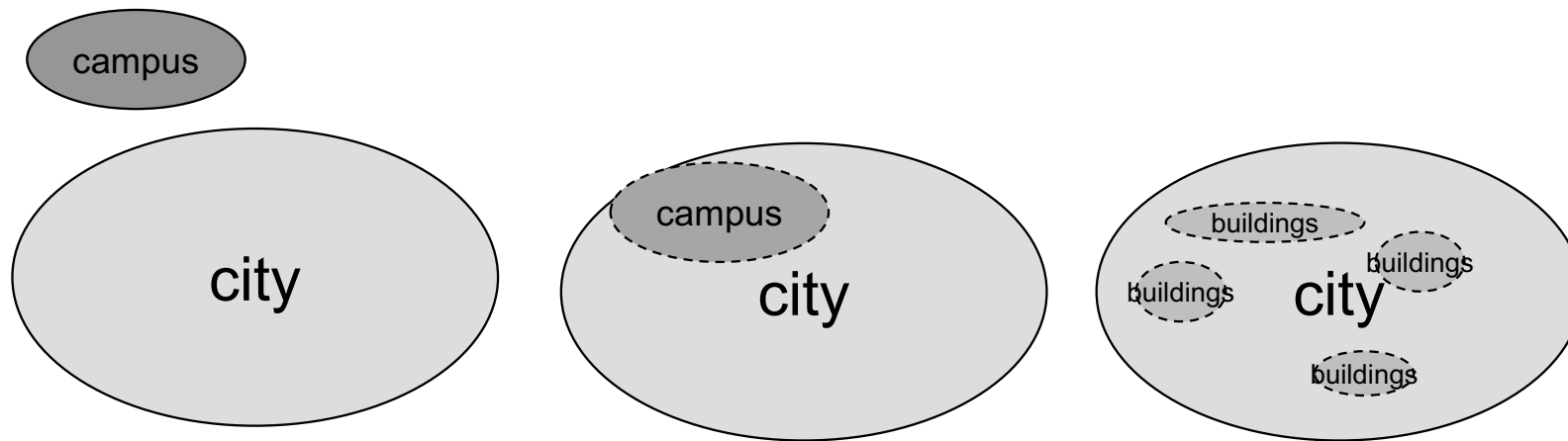
# Campus of the future

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1. Vision on the campus of the future
2. Campus management challenges
3. Using big data & smart tools for management information



# PHYSICAL definition of “campus”

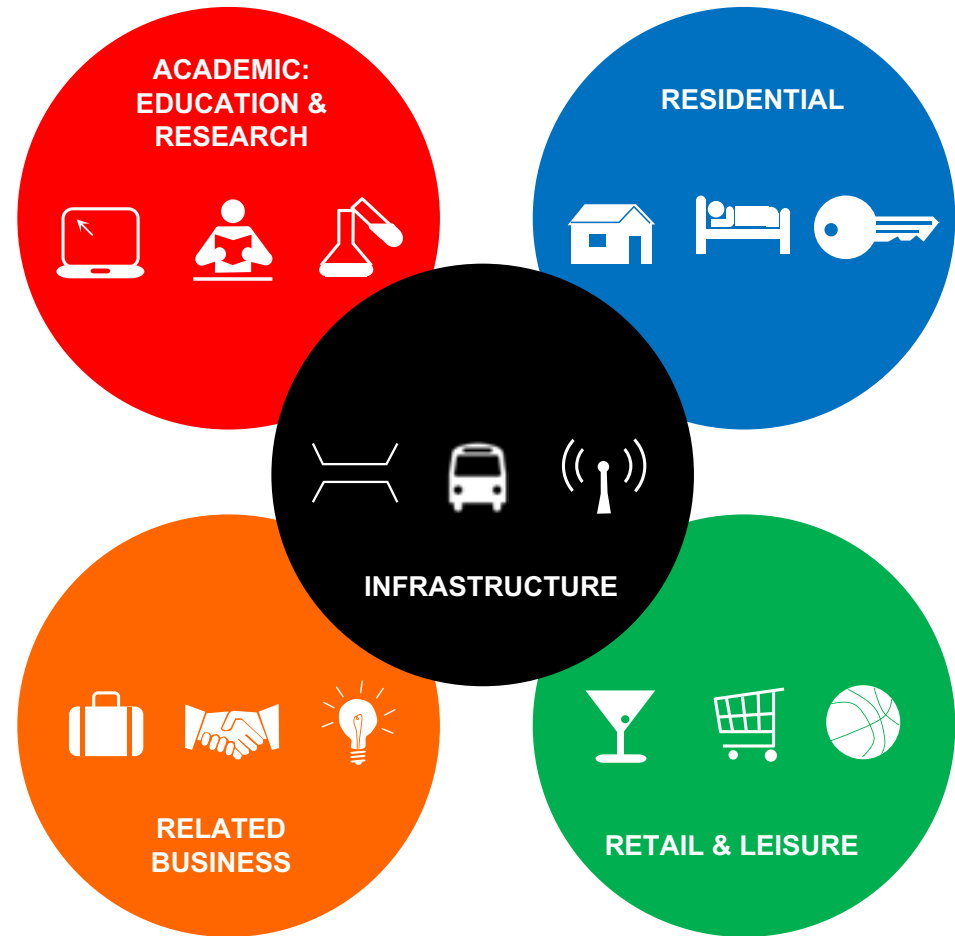


the “campus” is defined as the (collection of) buildings and land, used for university or university-related functions



# FUNCTIONAL definition of “campus”

- **ACADEMIC**  
classrooms, library, offices,  
laboratories, lecture halls, ...
- **RESIDENTIAL**  
student housing, hotels, ...
- **RELATED BUSINESS**  
start-ups, incubators, industry,  
...
- **RETAIL & LEISURE**  
sports, restaurants, cafes, ...
- **INFRASTRUCTURE**



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Around the year 2000...  
... literature and lectures about the future campus claimed:

“Bricks will be replaced by clicks”

“Campus managers will  
become ICT managers”

Campus strategy  
“Clicks & Mortar”

(book: 21<sup>st</sup> century universities)

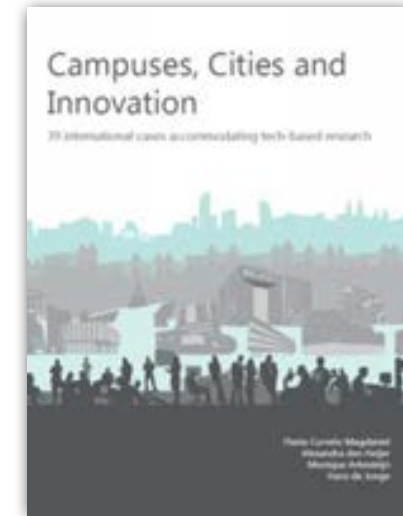






Content presentation based on

- Campus **NL - past, present & future**  
all 14 Dutch universities assessed  
in 1999, 2006 and 2016
- PhD thesis / dissertation  
“Managing the university campus” (2011)
- Case study research:  
“European campus”: 28 EU member states  
(2014), 39 Science parks in/as cities (2017)
- **TU Delft’s CAMPUS RESEARCH TEAM**



May 13, 2008

Building TU Delft's Faculty of Architecture  
totally destroyed: 3000 students + 1000 employees "homeless"



# "Campus of the future" – 3 models – "solid, fluid, gas"



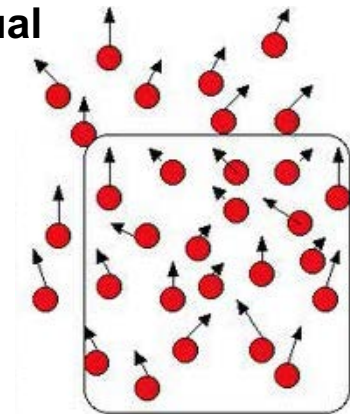
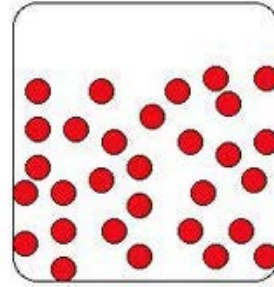
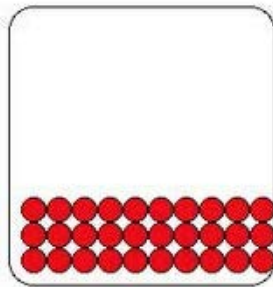
A = traditional



B = network



C = virtual







"Solid state"

Campus of the future:  
**model A – traditional university**

- strong hierarchy: top down
- fixed organisational structures
- exclusiveness, facilities per faculty
- individual territory / workplaces
- can we still afford this?

### Positive associations

- Traditions, rituals
- Loyalty, belonging: "members only"
- "My own office..."
- Community feeling: academic family
- Ownership
- Home

### Negative associations

- "You can not use ... my office, meeting room, lab..."
- Campus costs > 20%
- High footprint user
- Closed doors
- Old-fashioned
- Island culture
- Inflexible / empty...

## Lower budget per student



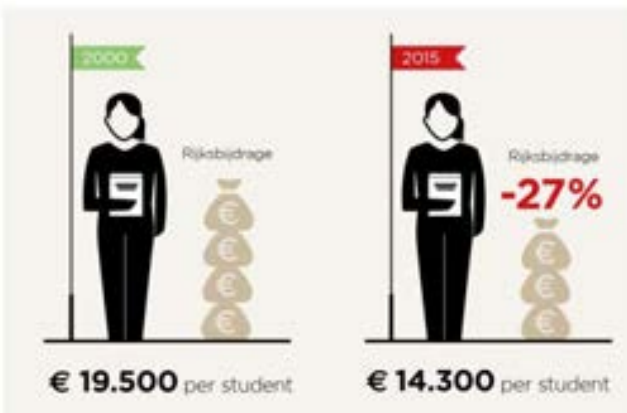
Student population – 2000-2015



Public funding – 2000-2015



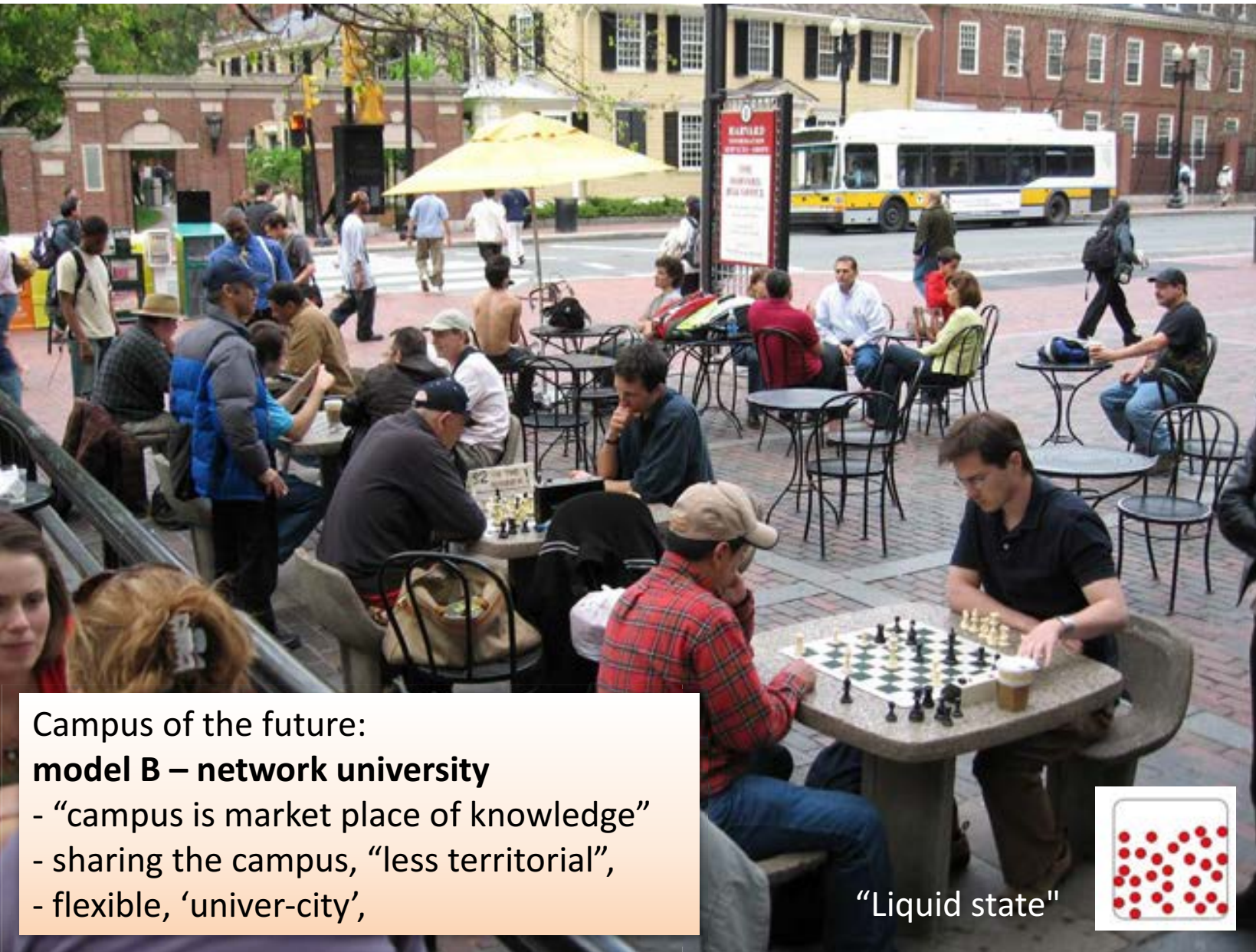
Lower budget per student



## University strategy = Resource-efficiency

- human resources: larger groups, fewer teachers
- energy resources: climate change, circular, no waste, energy-neutral
- financial resources: doing more with less

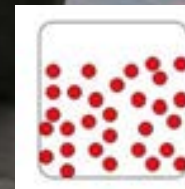




Campus of the future:  
**model B – network university**

- “campus is market place of knowledge”
- sharing the campus, “less territorial”,
- flexible, ‘univer-city’,

“Liquid state”



### Positive associations

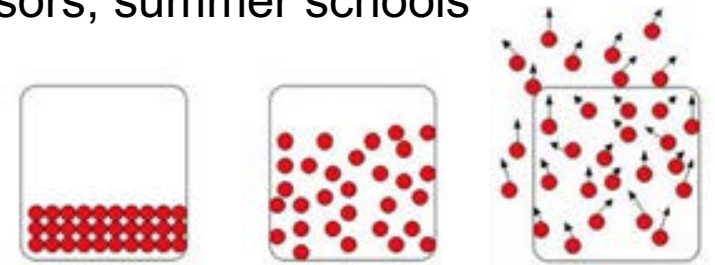
- Interdisciplinary
- Working in multiple teams, > 1 boss
- Serendipity
- Meeting place
- Open, more visible
- Flexible
- Campus costs lower

### Negative associations

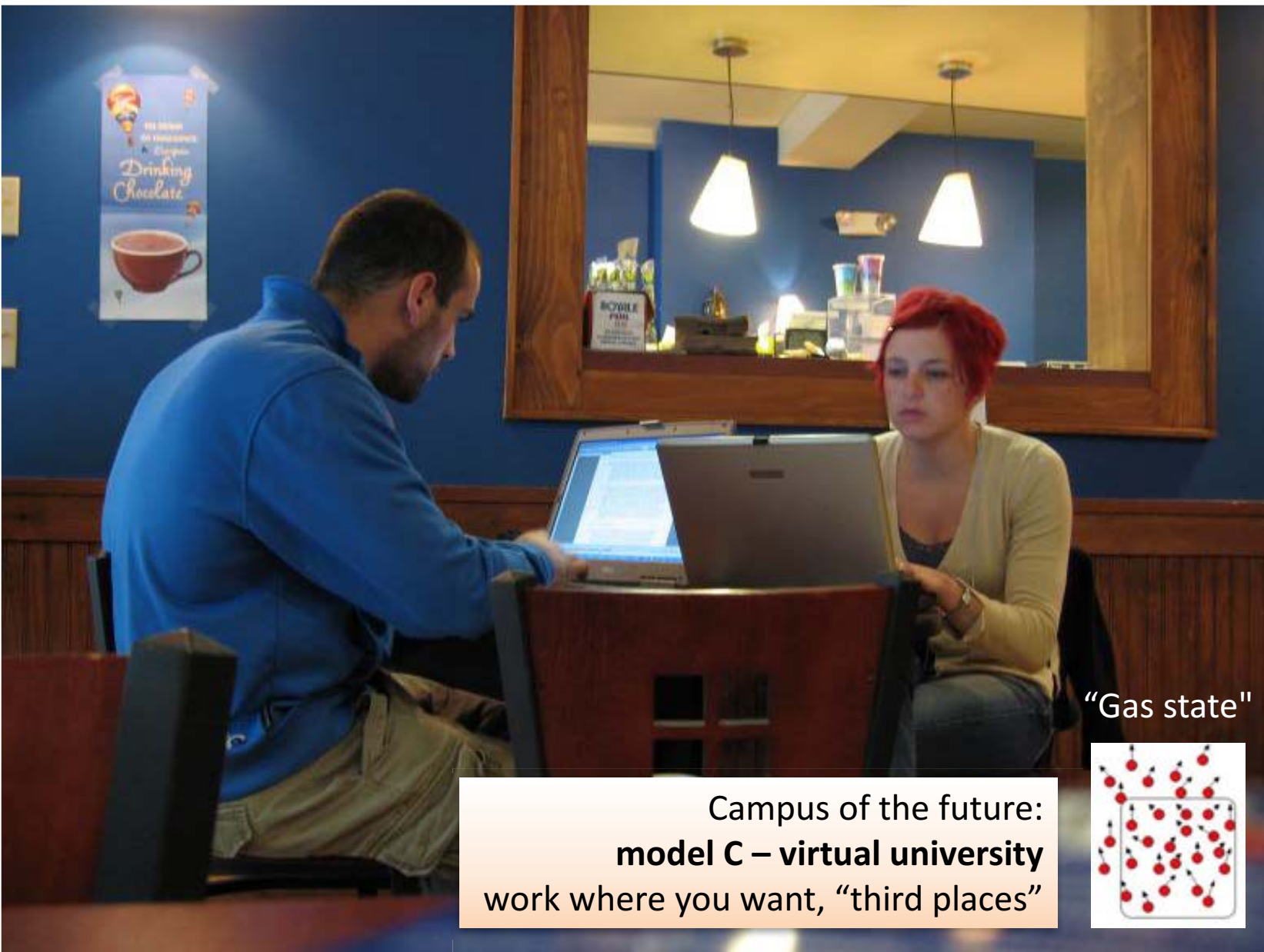
- Anonymous in large organisation
- Everyone’s workplace is nobody’s workplace
- Distractions, less privacy
- More mobility on campus

# Current + future campus = more dynamic

1. More **temporary** staff – short contracts, visiting professors, summer schools
2. More and more **visitors**
3. Staff and students **travel more**
4. **International** students
5. **Research** (funding) has become more **unpredictable** (<2 year contracts)
6. Functional demands **change rapidly** (labs, ICT, legislation)

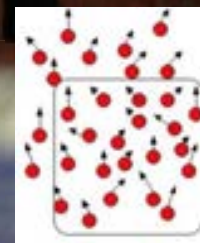






Campus of the future:  
**model C – virtual university**  
work where you want, “third places”

“Gas state”



### Positive associations

- Accessibility for long-distance students
- Very flexible
- Campus costs < 5%
- Very flexible
- Paperless
- Work-life balance  
own responsibility

### Negative associations

- Lonely
- Social isolation
- Less loyalty to university
- Lower course completion rates
- Work-life balance hard to manage



from: <http://www.bbc.com/news/business-26925463>

**“Online students can’t help being sociable” (April 9, 2014)**

**It was a revolution moving higher education from bricks to clicks... and now it's started to go back to bricks again.**

Online university providers, which offered people the chance to study from home, are turning full circle by creating a network of learning centres where students can meet and study together.

Instead of demolishing the dusty old classrooms of academia, the online university revolution is responsible for opening some new ones.

Coursera, a major California-based provider of online courses, is creating an international network of "learning hubs", where students can follow these virtual courses in real-life, bricks and mortar settings.

They're scheduled and arranged online, with the only vital ingredients being a laptop, wi-fi and somewhere to talk.

“The typical completion rate for a MOOC is about 5% to 10%.

For MOOC students who attend learning hubs, the completion rates are above 30%”

Source: Coursera  
(7 mln students)

# Campus **models A-B-C** as basis



**A = traditional**  
- exclusive & territorial -



**B = network**  
- interactive & shared -



**C = virtual**  
- place independent & individual -

trend in 2006 “from bricks to clicks”

trend in 2016, 10 years later



 **TU Delft**

Faculty of Architecture and the Built Environment  
> 3.000 students, > 800 employees  
#3 in 2018 QS Ranking Architecture schools





BK city (desian 1917 > 100 years ago) is "new old" building of the



“the search for a quiet place  
to study”

“students queue up < 9am”



the library of Nanjing University in China

# Mental health & safety

... high on the university's agenda

political conditions  
ambitions university  
agenda city



user demands  
**health & safety**  
functionality



Source: MazeMap, NTNU website

costs per m2  
total costs of ownership  
market value



architecture - location  
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“Work pressure too high”



Too many distractions at home: roommates, Netflix etc.



“Will silence be the next scarce resource?”

**LinkedIn**

**Ban laptops from meetings?**

Is it okay to be on your computer or phone during work meetings? Politeness aside, **research suggests** that even the mere presence of a phone in the room compromises our brain power. That has made some companies enforce a no-device policy during meetings in order to boost efficiency and collaboration, **reports CNN**. The report looks at companies like Skift, which have **effectively outlawed computers** in meetings. Similarly, there's growing evidence that bringing a laptop into the classroom is hurting students' ability to learn, according to a **report in The New York Times** last year.



French universities ban smart phones from school

ECONOMIC VIEW

**Laptops Are Great. But Not During a Lecture or a Meeting.**



Peter Arlin

“Love-hate relationship with the smart phone”



# Why “campus favorite study place”?

## “push factors”

- Distractions at home:
  - room mates
  - social life, hobbies
  - Netflix
- More pressure on students:
  - higher tuition fees
  - stricter deadlines, rules
  - risk of burn-out

### *Students:*

*“Protect us from working day & night”*

*“We need regular working hours and deadlines”*

*“We need to work on campus to be disciplined and focused”*

## “pull factors”

- Quality of campus:
  - better facilities, network, ICT applications
- Other students
  - more group work
  - group pressure to study
  - friendship and love (!)



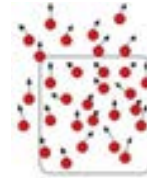
# Campus of the future: study space



Studying at  
your own faculty library



Learning centres  
(to share) on campus



Public library (example: NY),  
at coffee bars, at home etc.



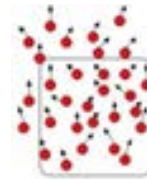
# Campus of the future: lectures



Lectures without distractions  
(= laptops & smart phones)



Technology-supported  
lectures



MOOCs:  
Massive Open Online Courses



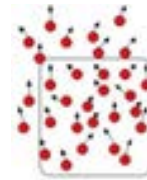
# Campus of the future: workplace



Individual territory 2.0  
(quiet) cellular office



Activity-based  
workplaces to share



Workplaces off-campus  
like home





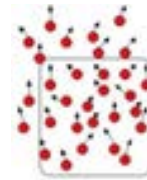
# Campus of the future: meetings



Old-school meetings  
(without technology)



Technology-supported  
meetings



Virtual meetings





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## NETWORK with the following partners from PRACTICE

**UK**  
166 HEIs  
22 million m2  
700 professionals



**THE NETHERLANDS**  
14 HEIs  
5,1 million m2



**EUROPE**  
2400 HEIs  
170 million m2



+ 18 academic partners



**NORWAY**  
40 HEIs  
2,9 million m2



**FINLAND**  
10 HEIs  
1,1 million m2



**SWEDEN**  
51 centres of education  
3,2 million m2

**CZECH REPUBLIC**  
26 HEIs  
1,6 million m2

source: website data

# 2400 HEIs / universities in Europe

need management information to make 'the right' decisions

political conditions  
ambitions university  
agenda city



user demands  
health & safety  
functionality



Source: MazeMap, NTNU website

costs per m2  
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# The European Campus Heritage & Challenges (2014)

*The university Campus is an **asset** for Europe's knowledge economy:*

- quality of place,
- cultural heritage buildings,
- attractive univer-cities

*The university campus is a (potential) **problem** for Europe's knowledge economy:*

- bad technical state
- inefficient use of space
- costly maintenance

*Managing the campus as strategic resource requires:*

- More information on all perspectives
- More references to support decisions

866 universities / 24 member states / 9 indicators







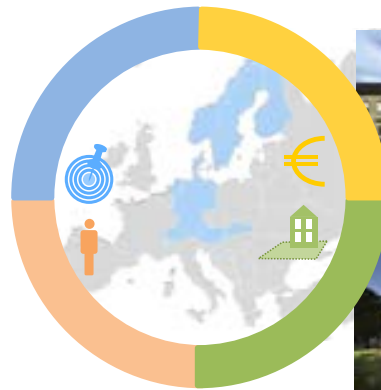
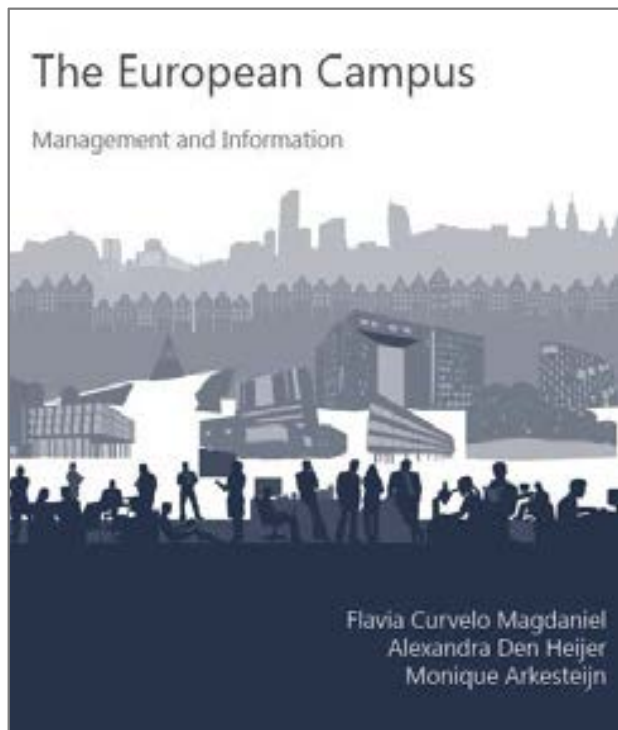




# The European Campus (2019)

## Management & Information

*14 universities of technology / 9 countries / 29 indicators*



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We asked campus managers  
in 2015... urgencies?



“claiming space and not using it”  
“in top 10 holiday frustrations”





Reality campus: underutilized, often empty  
Perception users: booked, full



# Big data about real-time use of space

... “the key to better campus management”

political conditions  
ambitions university  
agenda city



**user demands**  
health & safety  
**functionality**



Source: MazeMap, NTNU website

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# “The schedule often provides FAKE news”



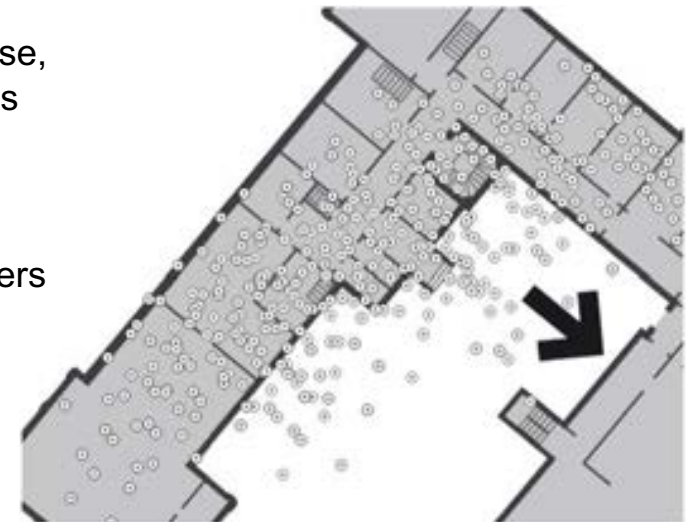
## Start of a PhD study > 2016

- Bart Valks
- Supervised by Campus Research Team
- Supported by graduate students

Collecting big data about campus use,  
based on positioning of user devices

(image: Rob Braggaar, 2017/2018)

To connect and support campus users





Source: <https://www.blackbox.com/en-us/products/black-box-brand-products/video-multimedia/room-scheduler>

# Campus of the Future – collecting big data

# persons  
in library



Source: TU Delft research on TU Delft campus - searching for use patterns, **based on REAL-TIME DATA**



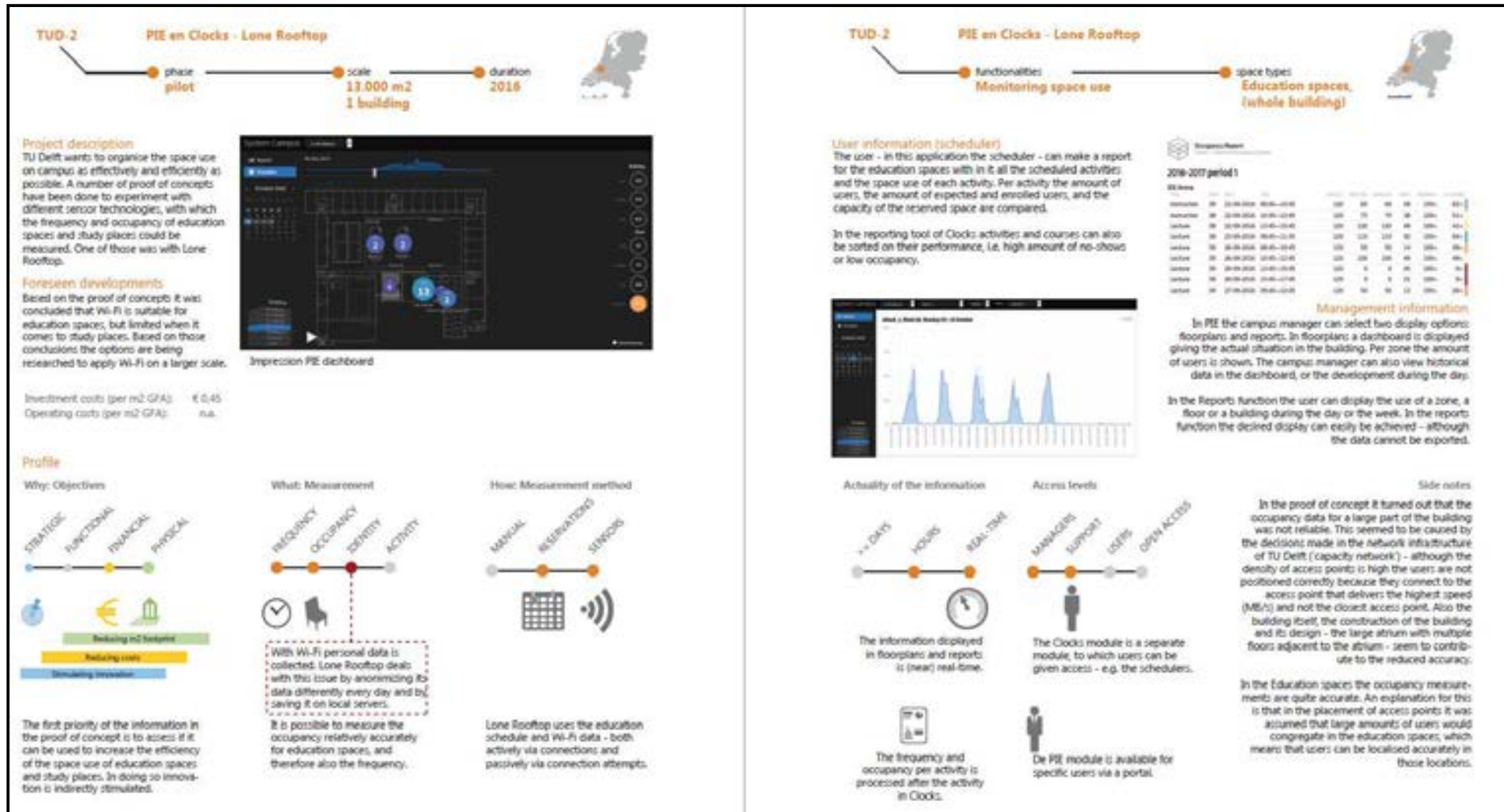
GPS-Tracking  
Using Eduroam/WiFi

GPS-Navigation  
Find a quiet study place

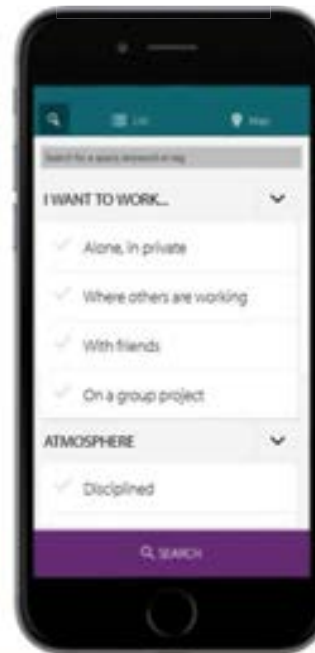
Smart campus tools  
based on REAL use  
(not on scheduled use)



# Smart campus tools 2.0 format



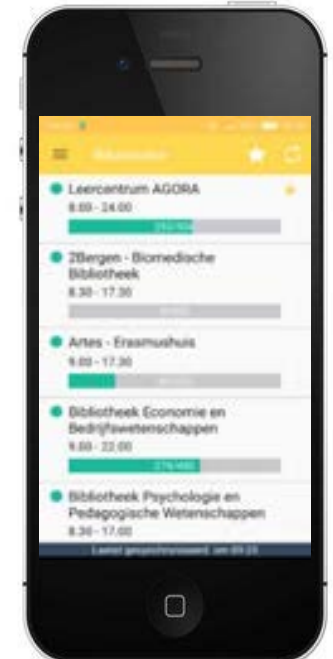
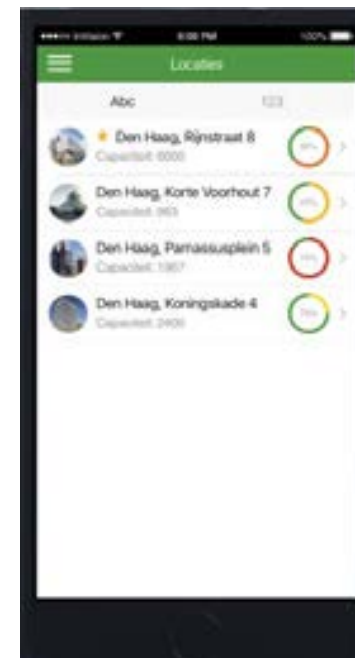
## Cases



## Spacefinder

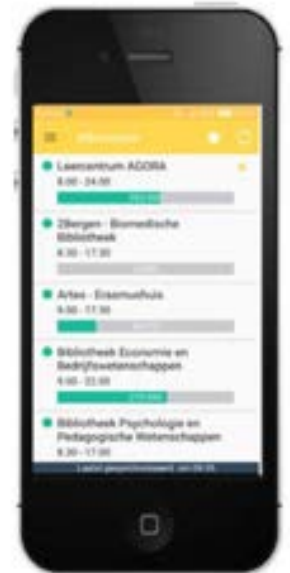


Rijksoverheid



# 1 Smart tools to find available study places

- Cause is a perceived lack of study places on campus by students or desire of library to improve its service
- There is a shortage of available campus management information for study places. How well are study places used?
- Solution contains:
  - Real-time availability
  - (Booking of project spaces)
  - (Location of study places)
  - (Properties of study places)





## 2 Smart tools to optimise teaching space use



- Cause is a wish to further optimise frequency and occupancy rates
- Possibility to monitor and adjust based on no-show behaviour and expected student attendance
- Solution is measurement of space use via Wi-Fi ;  
in some cases intended via infrared



### 3 Smart tools to share classrooms for studying

- Cause is a perceived lack of study places by students or wish of library to improve its services
- Solution is the use of ~25% initial vacancy in classrooms
- Solutions have multiple components – also booking project rooms, finding study places with PCs



UNIVERSITEIT VAN AMSTERDAM



## 4 Finding free (office) workplaces

- Cause is a transition to shared workplace concepts, lower amount of workplaces per FTE
- Employees can find a workplace in a building or search between multiple locations
- Alternative measurement methods: Wi-Fi, docking stations, desktop PCs





## 5 Optimising the use of meeting rooms

- Cause is a shortage of meeting rooms, and many unused meetings due to high employee turnover rate
- Solutions use infrared sensors and videoconferencing facilities



## 6 Aligning building use and energy use

- Cause is the wish to avoid waste of energy on vacant buildings and spaces (combined with other demands)
- Cases contain multiple sensors and functionalities.
  - Possibility to adjust temperature and light to preferences
  - Reserving workplaces (check-in)
  - Find your colleague, wayfinding etc.



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# **“Bipolar campus strategy”**

**reinventing the past + supporting the future with smart tools**



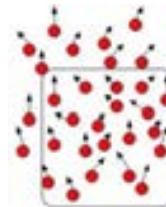
“Do not disturb”  
“Off the radar”

“Place to meet”  
“Interconnected”

Solitude  
Silence  
Offline

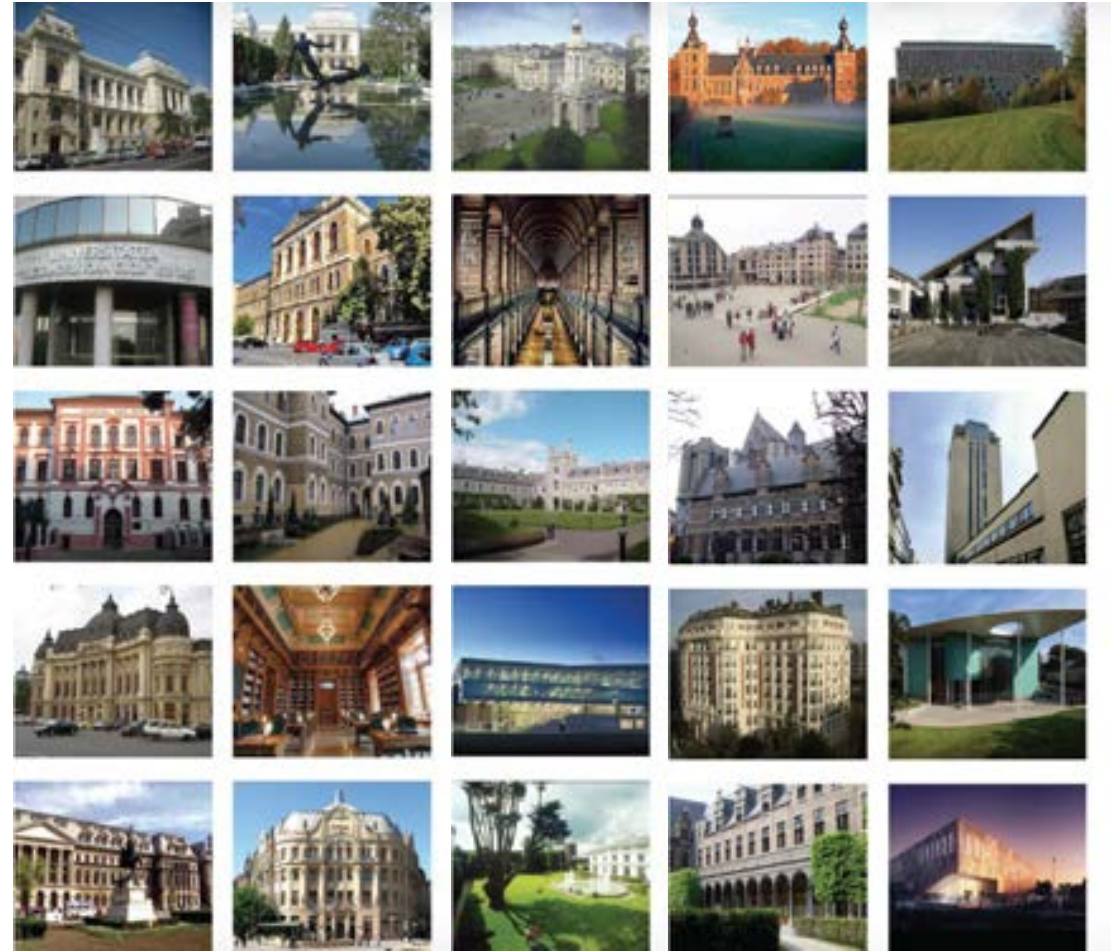


Community  
Buzz  
Online



# Yes, we can afford the **campus**

- if we are prepared to share more space and use smart tools to be more resource-efficient





# Managing the university campus

HOME ABOUT THE 2011 BOOK AUTHOR CAMPUS EU CAMPUS NL CAMPUS RESEARCH TEAM  
CASE BK CITY DOWNLOADS PUBLIC REAL ESTATE PUBLICATIONS SMART TOOLS TOUR



APRIL 30, 2019 - 23:49 | EDIT

## Writing a new book... off-campus

by Alexandra den Heijer

In the past months I have been spending less time on social media and increasingly more time offline. I noticed that I actually seem to practice what I preach (...): moving somewhat back from virtual to traditional. Not only concerning the working environment, but also with respect to traditional working hours. Nonetheless, I still make exceptions. Otherwise I would not write and publish this blog post late at night...



## About the books

2018 book - Smart campus tools 2.0



For more info please send a mail to Bart Valko: b.valko@tudelft.nl

2017 book - Campuses, Cities and Innovation



## About this blog

Author Alexandra den Heijer (professor of Public Real Estate, Faculty of Architecture and the Built Environment, TU Delft) started this blog when her book "Managing the university campus" was published in March 2011. The blog describes the process after the book launch (March 4, 2011): the publicity, many lectures, articles, papers, new research and visits to campuses all over the world.

Interested in joining our CAMPUS RESEARCH TEAM? See weblink for jobs: <https://www.tudelft.nl/en/about-tu-delft/working-at-tu-delft/search-jobs/>



.nl  
.com

## Our blog

- for more information...
- this PPT under DOWNLOADS
- books under SMART TOOLS and PUBLICATIONS

Thank you for your attention!

Google:

- Alexandra
- TU Delft
- Campus