Smart tools on campus

a literature study connecting real estate management objectives and positioning technologies

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Smart Campus Tools

Paper: connecting real estate management objectives and positioning technologies
ERES conference, June 2016




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Smart Campus Tools

Universities:

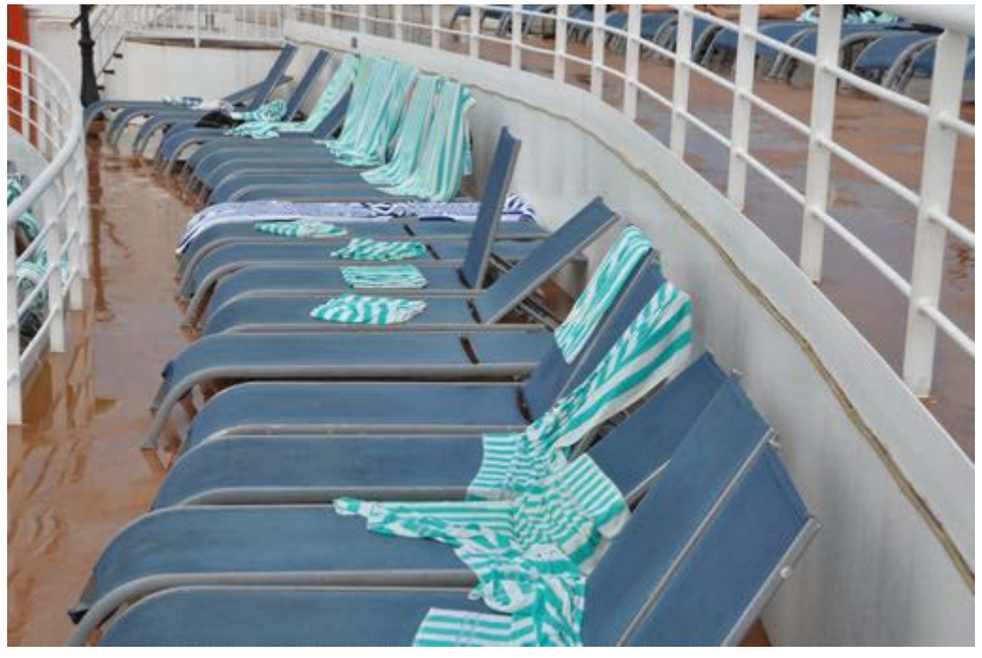
- Continuous student growth
- Pressure on existing space and renovation plans

User:
“reserved but not in use”

CRE Manager:
“expensive and poorly utilized”

Therefore: measure real-time use

* - based on Eduroam, Wi-Fi tracking, Occupancy sensors etc.



https://www.youtube.com/watch?v=5JtHdchJ4o8&

Problem: scale and scope (1)

Frequency: *Occupancy:*

Teaching space

- Objective is 70 percent *frequency*
- Predicted (timetabled) frequency is 62 percent
- Surveyed frequency is 50 percent

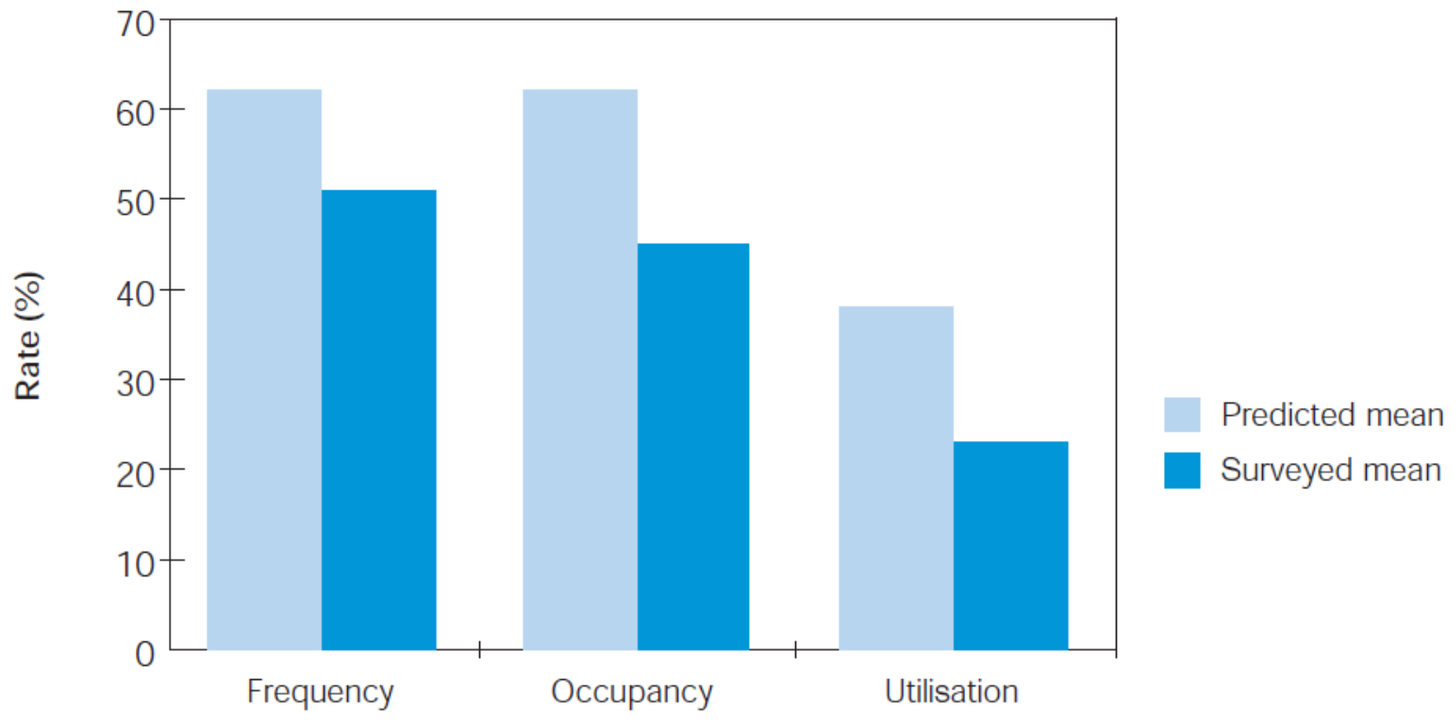


Table 2: EMS predicted and surveyed mean utilisation data 2003-04

Data in this slide can be found in SMG (2006): Space Utilization, Performance, practice and guidelines

Research project

Q

How can we align supply and demand in (educational) real estate as effectively and efficiently as possible?

Smart tools

A

Short term: real-time information helps users to better use space “right here, right now”

Long term: real-time information provides a richer picture which improves decision-making in real estate

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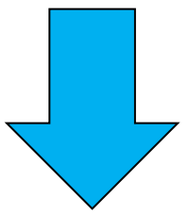
Smart buildings and smart tools

Buckman et al. (2014) -> What is a smart building

(1) the methods by which building operation information is gathered and responded to (intelligence);
(2) the interaction between the occupants and the building (control);
(3) the buildings physical form (materials and construction)
(4) the methods by which building use information is collected and used to improve occupant performance (enterprise).

+ adaptability



! a ‘smart tool’ is a tool that collects **real-time** data about **space use** and provides **actionable** information about space use to real estate managers and/or users

Objectives (1/3)

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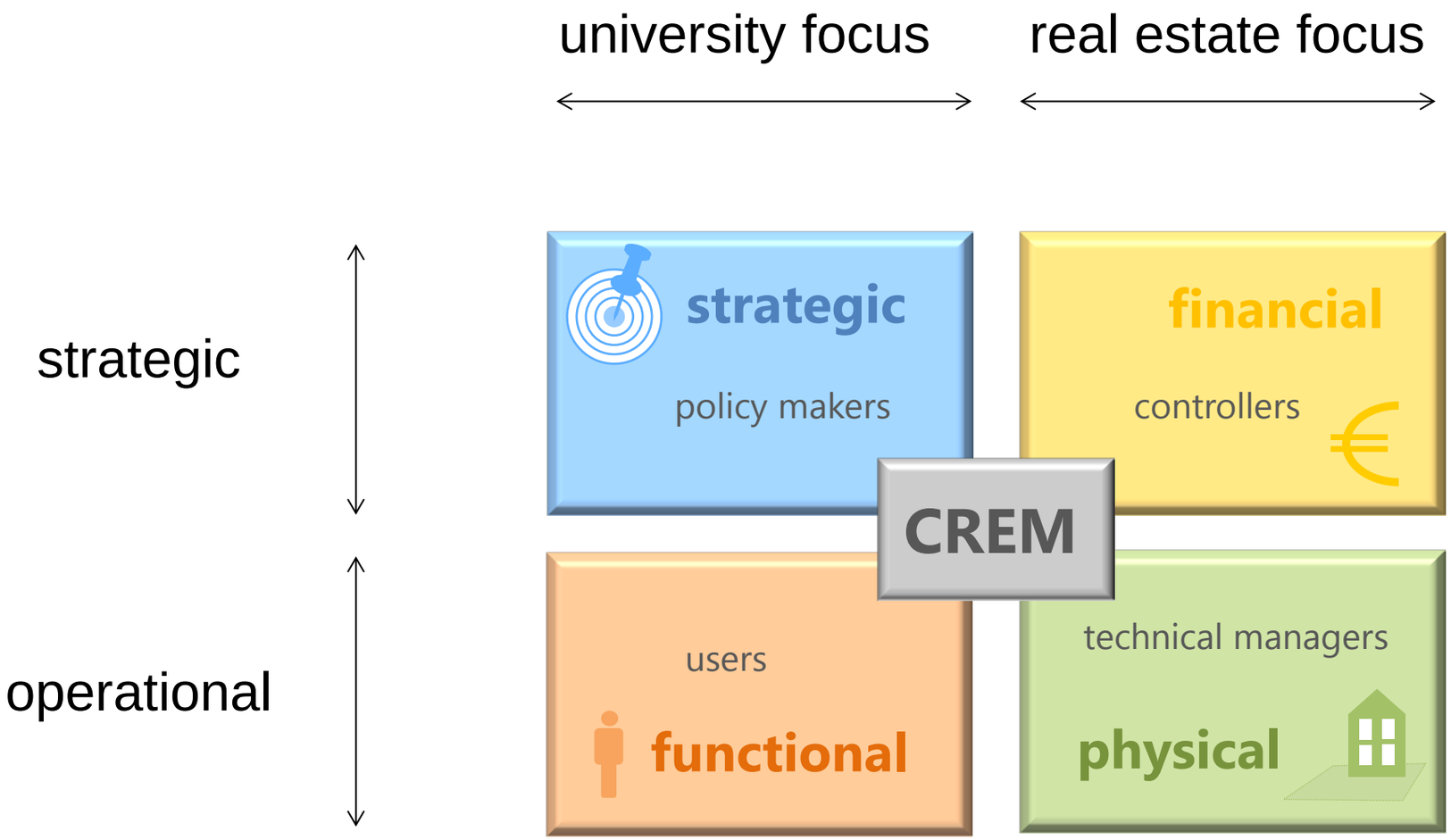

Den Heijer (2011): four stakeholder perspectives to connect in CREM

Objectives (1/3)

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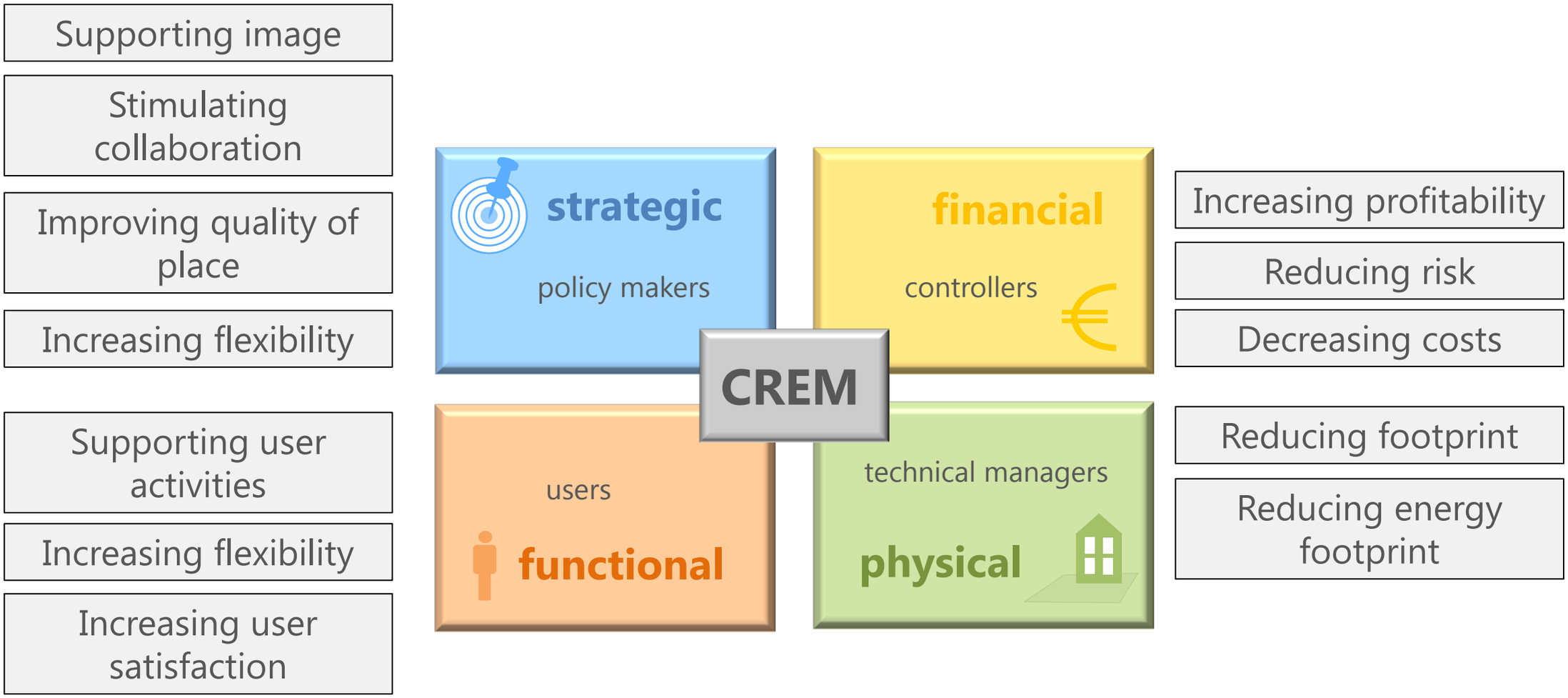


Den Heijer (2011): goals that will shape the future campus (per stakeholder perspective)

Type of measurement (2/3)

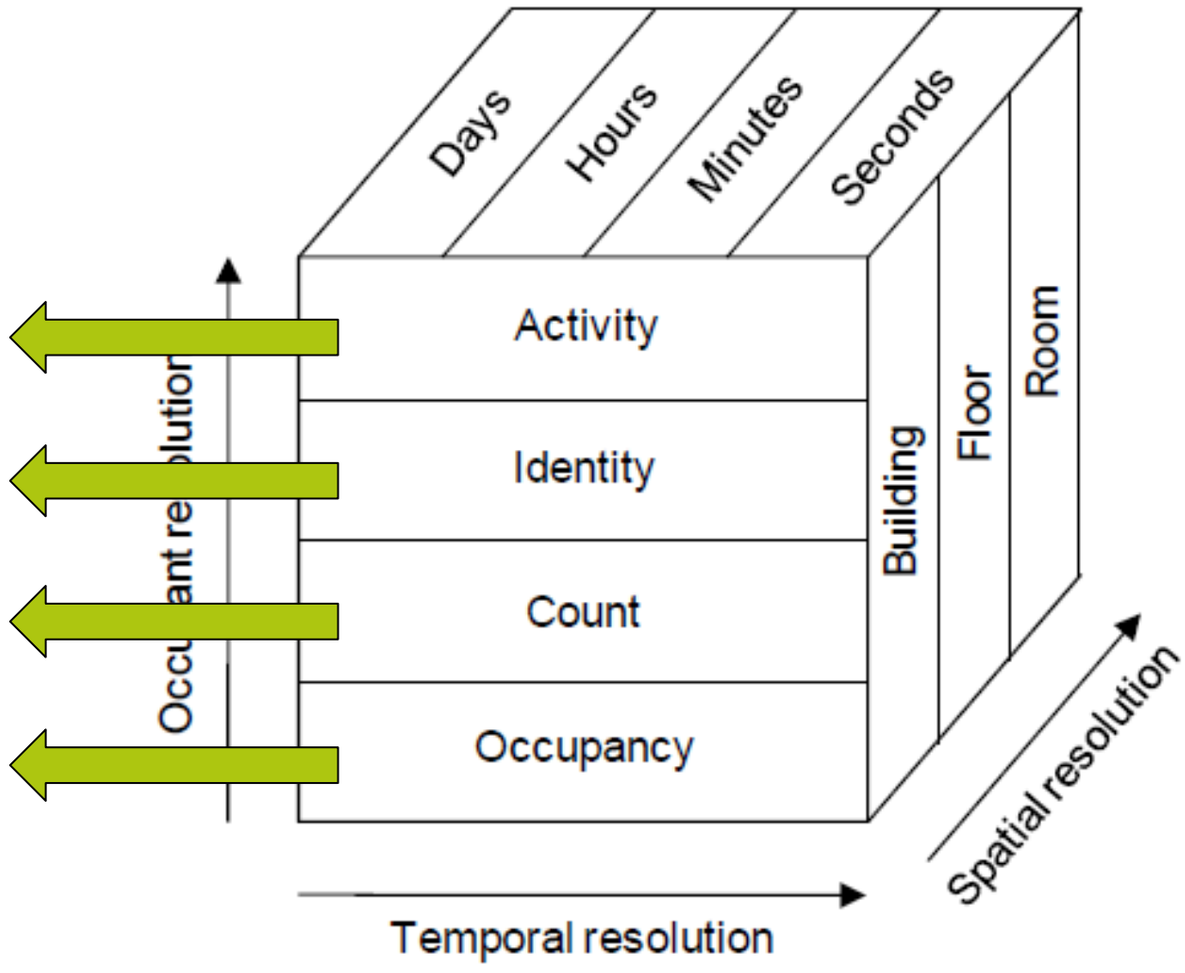
! a ‘smart tool’ is a tool that collects real-time **data about space use** and provides actionable information about space use to real estate managers and/or users

p1 is doing a, p2 is doing b, etc.

These x occupants are p1, p2, etc.

By x occupants

Occupied yes/no

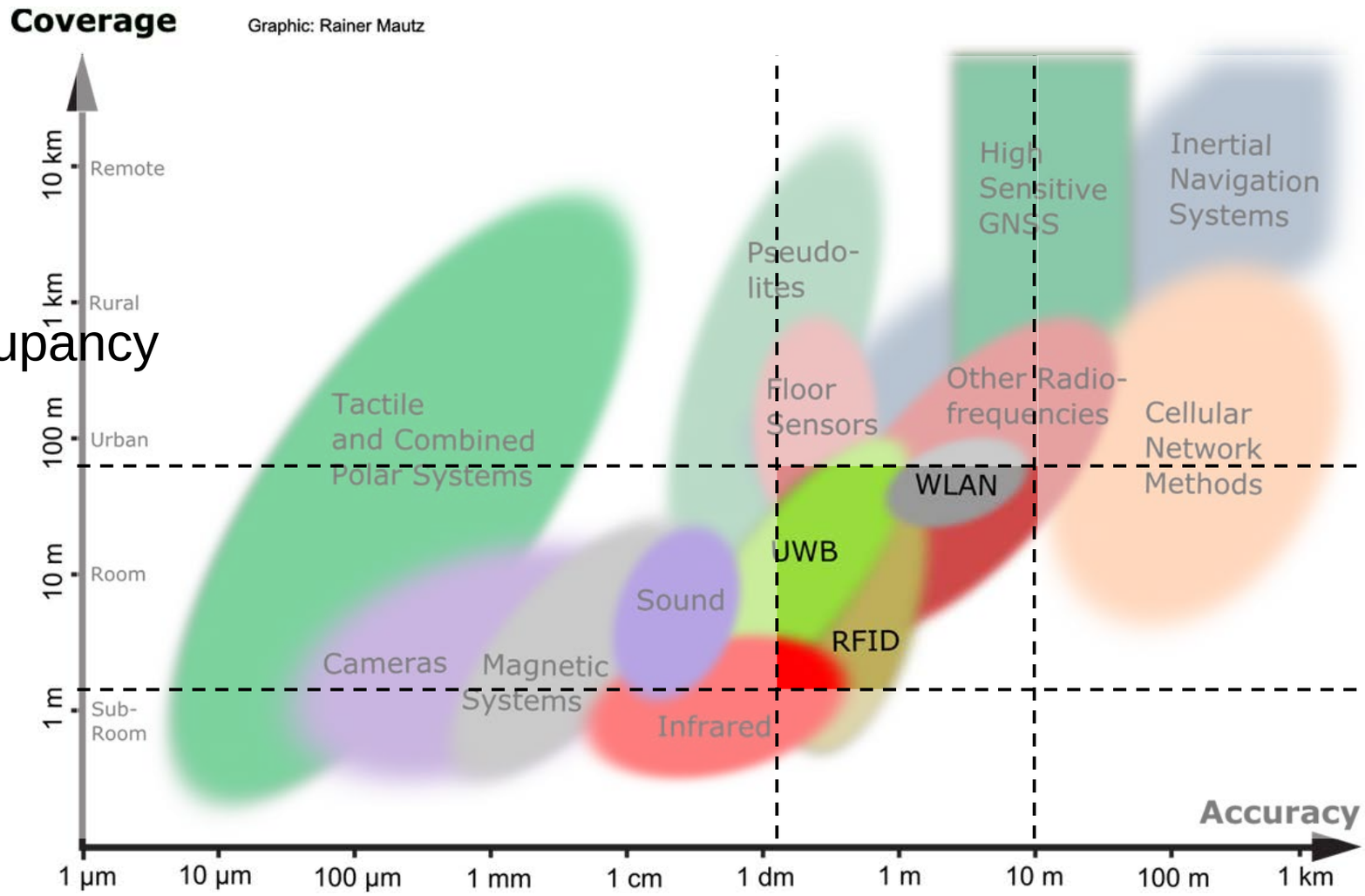


Christensen et al. (2014)
(to determine information quality)

Methods (3/3)

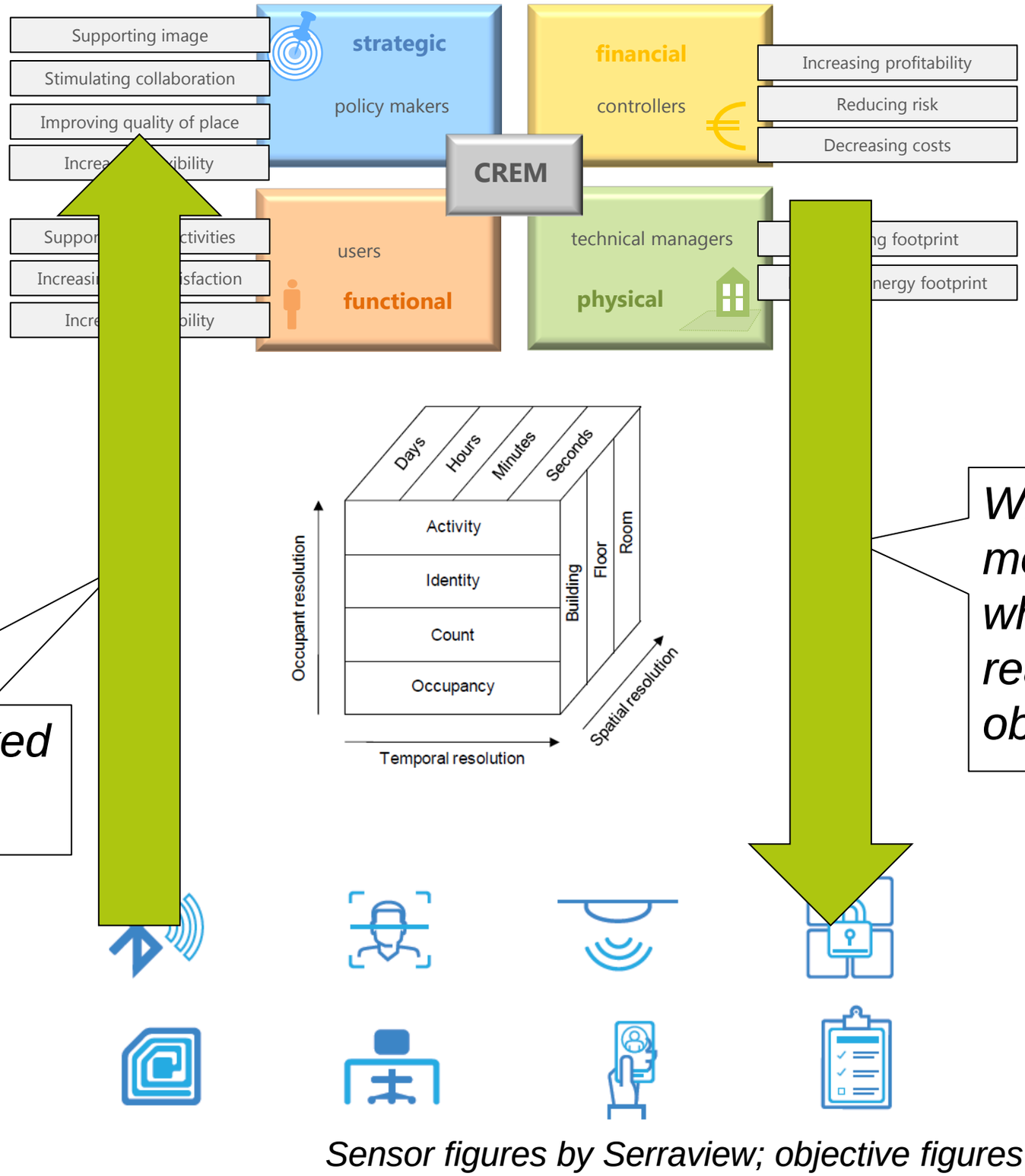
! a ‘smart tool’ is a tool that collects **real-time** data about space use and provides actionable information about space use to real estate managers and/or users

- RFID
- Wi-Fi
- UWB
- RF/Bluetooth
- Infrared (occupancy sensors)



Mautz (2012): methods for indoor positioning, sorted by accuracy and coverage

Literature study



How are sensors linked to CREM objectives

What needs to be measured and with which sensors to reach CREM objectives?

Sensor figures by Serraview; objective figures by Den Heijer (2011)

Research methods

- Literature study

1. Scopus query on different methods and objectives of indoor positioning: 200 papers
2. Selection of relevant papers; quick scan of 50 papers; CRE objectives, sensors, measurement objectives

Finding a relation CRE objectives – used methods

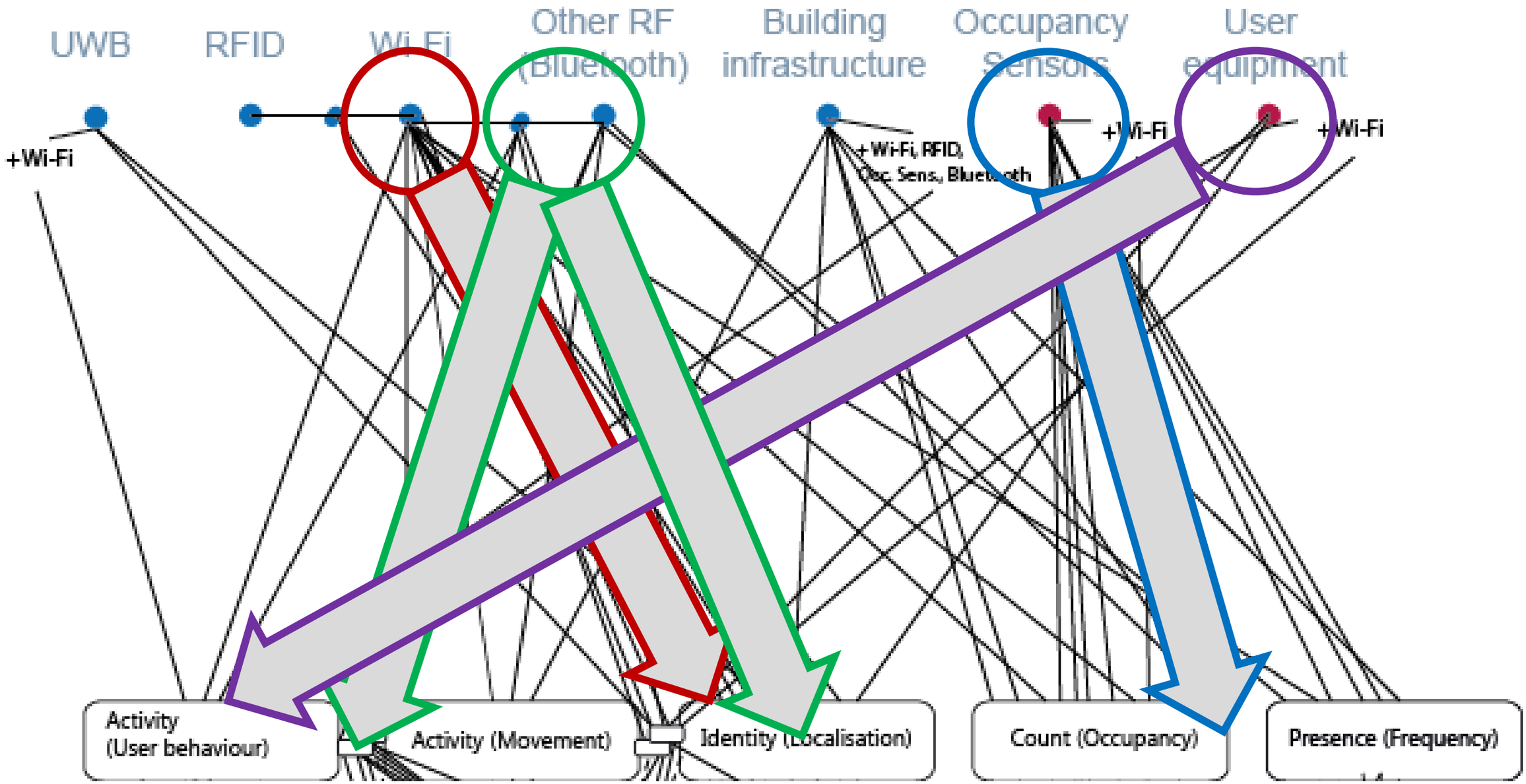
- Interviews

1. Phone interviews
2. Different stakeholders: consultants, end users, engineers

Best fit spatial scale and information requirements – sensors

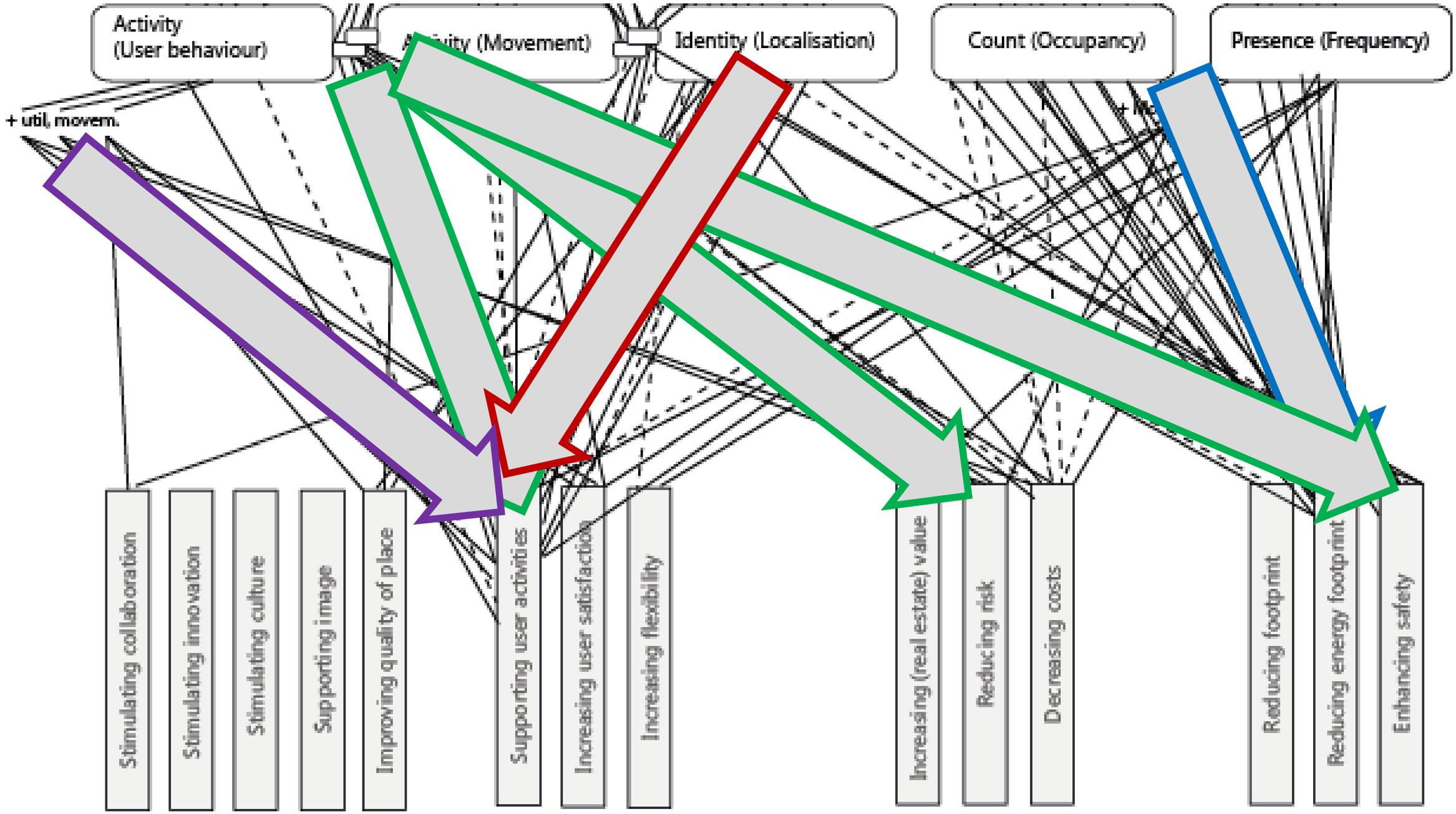
State of the art

Sensors



Occupancy levels

Occupancy levels



CREM goals

Conclusions

sensor

measurement

objective

themes

Wearables

Occupancy

Count

Identity

Activity (Movement)

Activity (Behavior)

Complexity

Energy savings

Supporting users
Improving services

Monitoring visitor flows, behavior at large events

Person tracking

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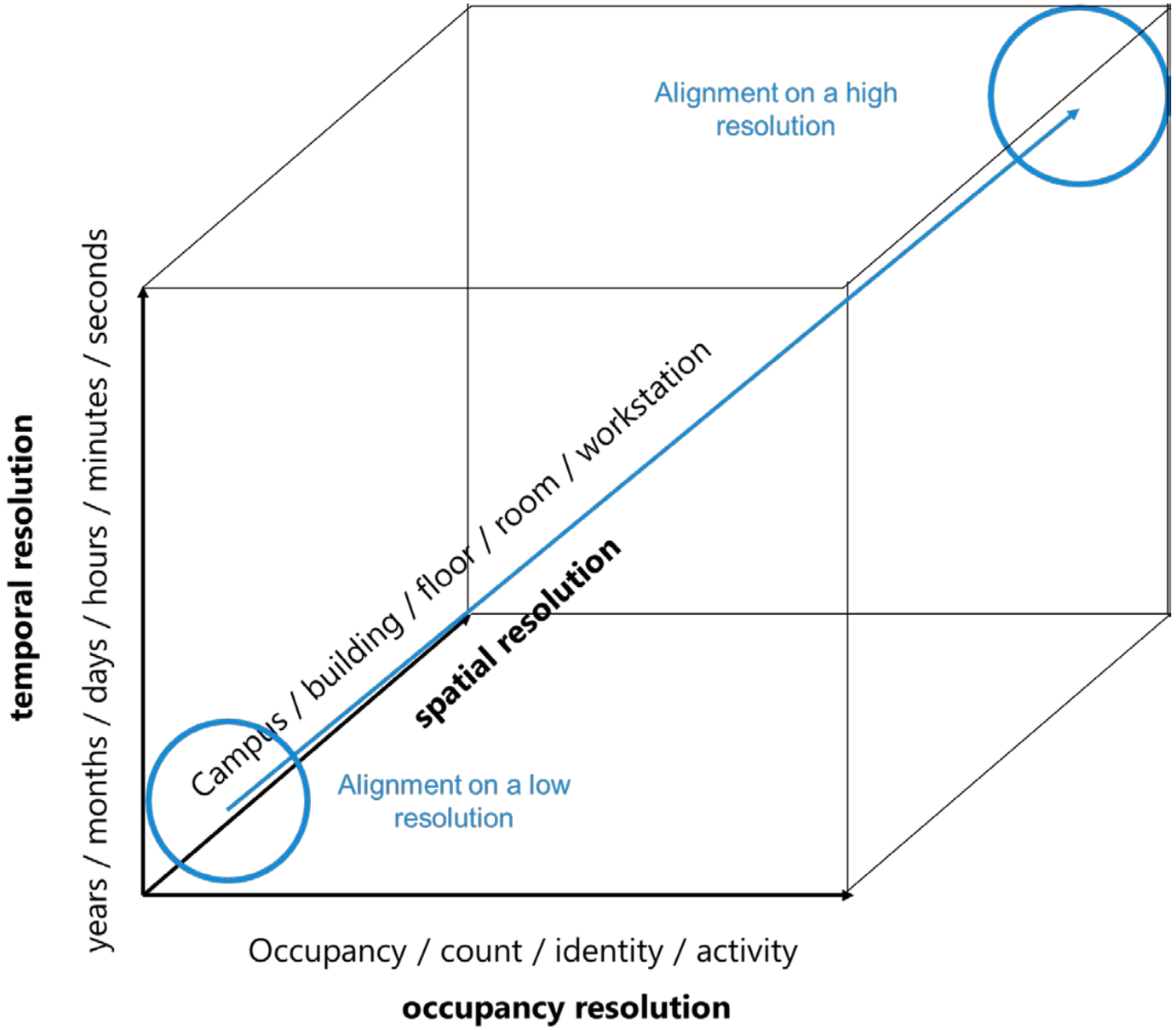
Sensor figures by Serraview; objective figures by Den Heijer (2011)

Conclusions and discussion

- Limited amount of publications
- Degree of variability in sensors, occupancy levels and CREM goals
- Strategic perspective, m2 reduction are hardly touched upon
- Increasing flexibility is hardly touched upon
  =/= smart tools?
- In studied papers the ‘why’ is hardly paid attention to



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