How AI and Emerging Digital Technologies will Influence the Future of the Energy Management Sector in the Built Environment

Dr Ruth Kerrigan
ruth.Kerrigan@iesve.com

How AI and Emerging Digital Technologies will influence the future of the Energy Management sector in the Built Environment

AI

Digital Technologies

Energy Management

Built Environment

AI

Digital Technologies

Energy Management

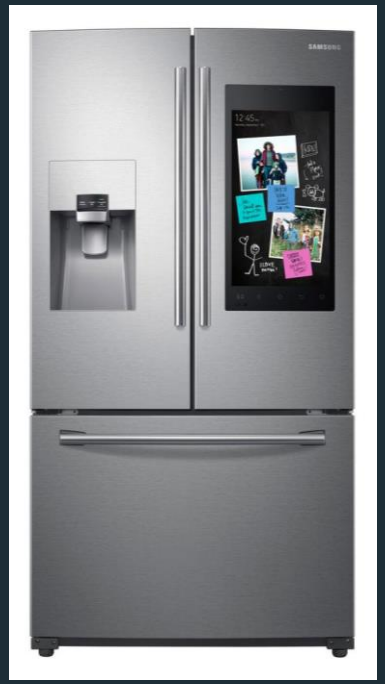
Built Environment

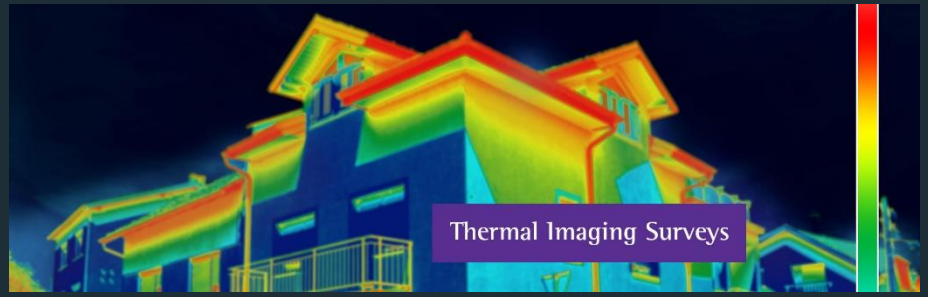
AI

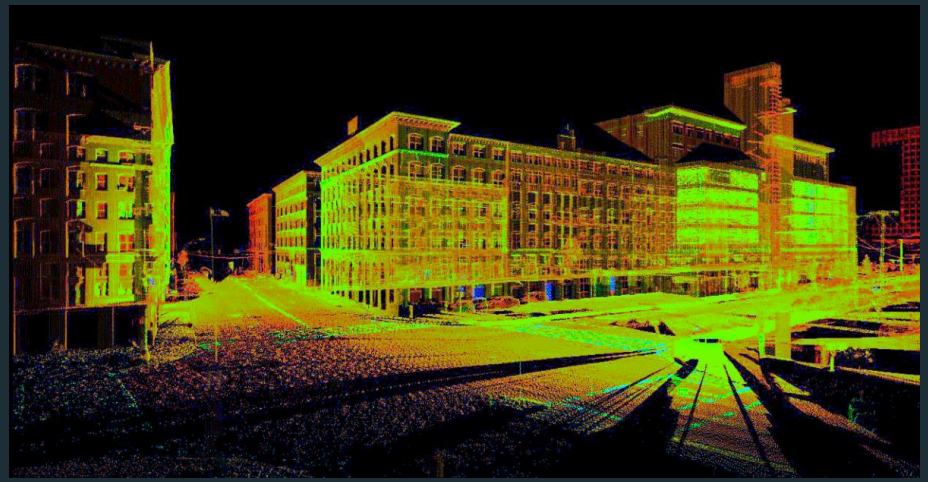
Alexa; Tell me a Joke…

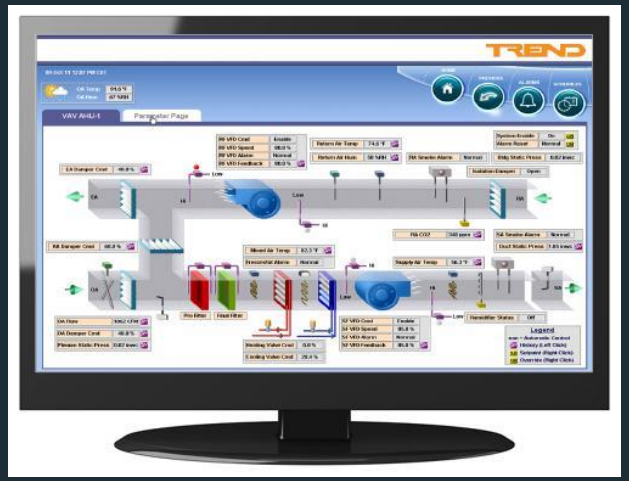
IBM WATSON

Digital Technologies







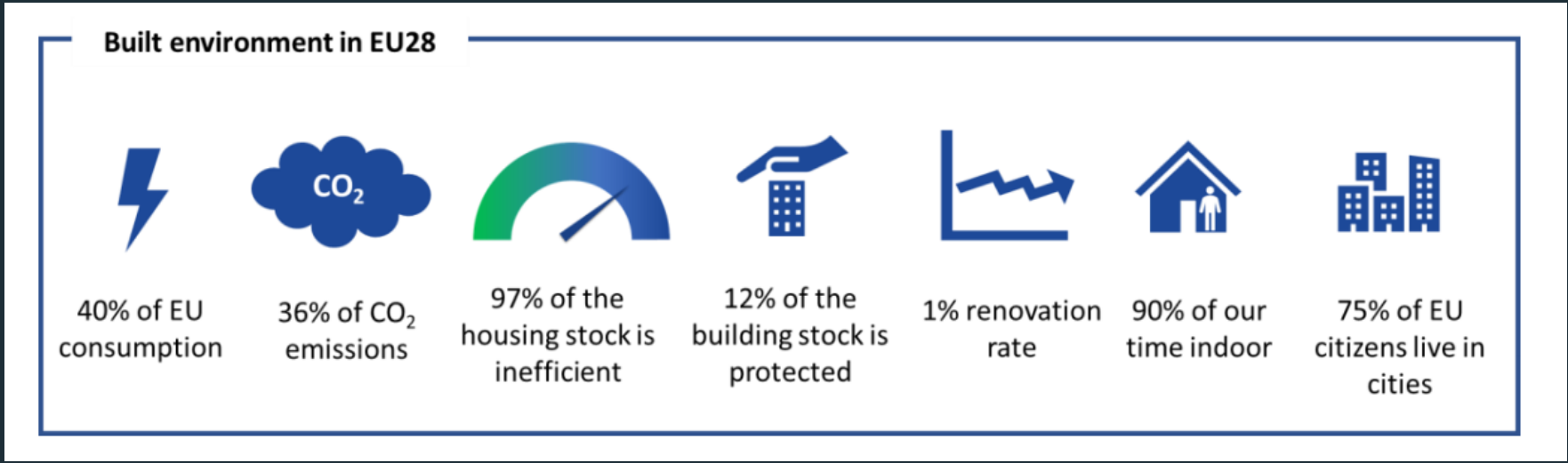


IES

www.iesve.com

Energy Management

Built Environment



Source: ECTP Strategic Research & Innovation Agenda 2021-2027

Barriers

Technical

Social

Financial

Legal/ Regulatory

Barriers

Technical

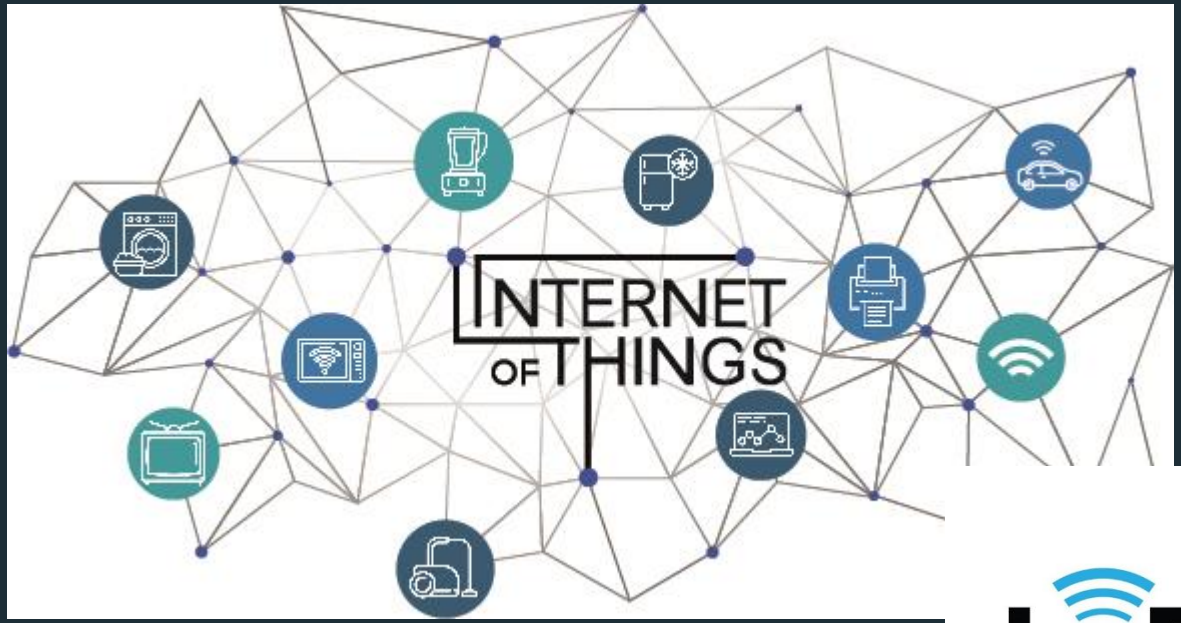
Social

Financial

Legal/ Regulatory

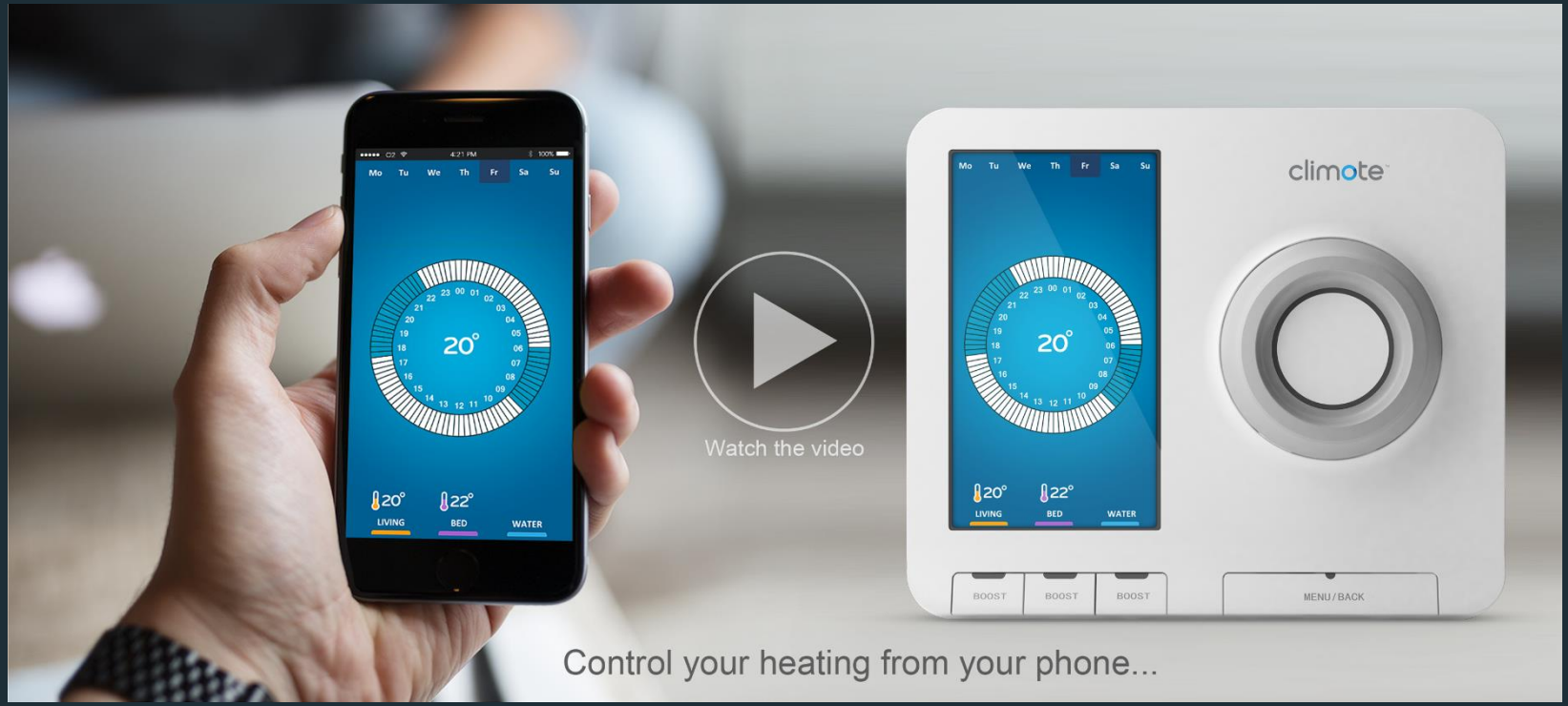
The Landscape is Shifting…?

…The Landscape has Shifted



LoRa™ NB-IoT™

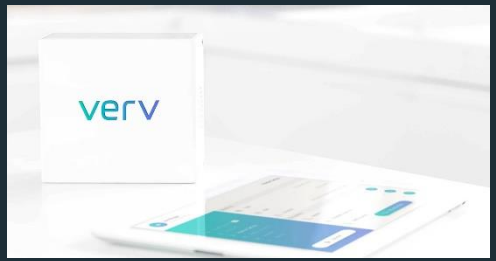
LTE-M sigfox


Watch the video
climote
Control your heating from your phone...


20°
TARGET
18°
ACTUAL

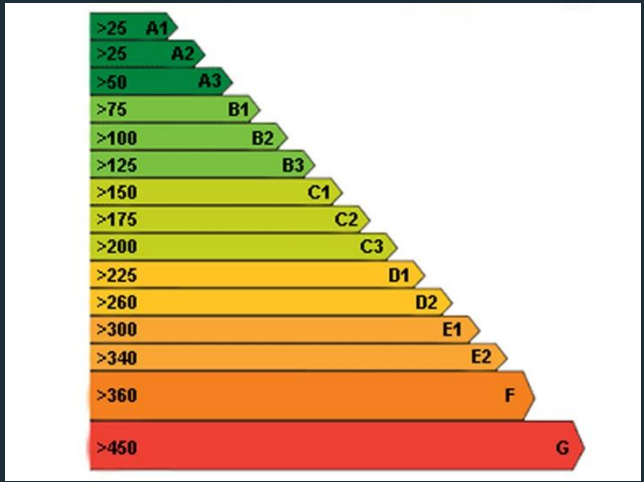

HIVE


20


verv

But our energy consumption is still not reducing? Why?

AMBER Assessment Methodology Building Energy Ratings



In some houses, energy consumption is 3 times anticipated consumption

In others, CO2 levels rising to 4,000ppm overnight

In others, CO2 levels rising to 4,000ppm overnight

Design Intent

vs

Building in Operation

How could AI help?

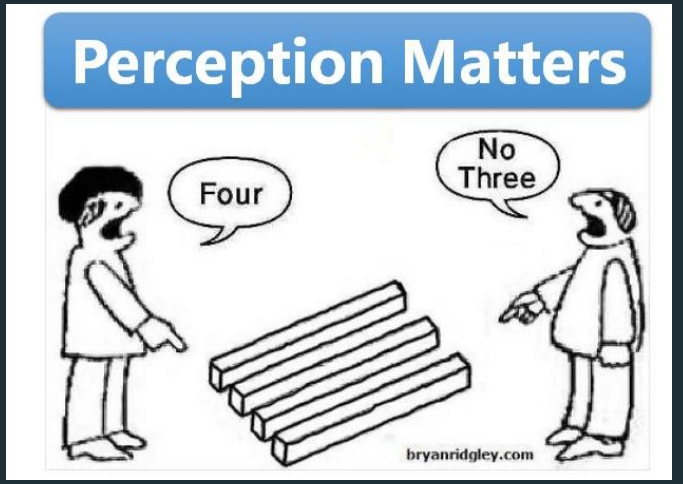
Ruth, why is your gas heating on, the temperature outside is warm and sunny, shall I turn it off for you

Ruth, can you check your ventilation system is working, your CO2 levels are very high

Why not just automate everything?


KNOWLEDGE

PEOPLE


Perception Matters
Four
No
Three
bryanridgley.com


You are
in
control

AI can drive behaviour…

AI can enable better choices…

AI can educate and inform…

What about non-residential?

Meet "The Brain"

Studies show that emotive avatars or characters enhance performance and engagement of users. The character helps create an emotional connection with the activity you want people to engage in.


INDOOR CARBON DIOXIDE
4,163 ppm
PERFECT!
INDOOR CARBON DIOXIDE
625 ppm
I'M STILL CONCENTRATING
BUT KEEP WATCHING
INDOOR CARBON DIOXIDE
1,042 ppm
HEADACHE
TIRED
I'M FREAKIN' OUT OVER HERE!!!
YIKES! OPEN A WINDOW!
INDOOR CARBON
851 ppm
IT'S GETTING STUFFY
CARBON DIOXIDE
1,042 ppm
TIRED
I'M FREAKIN' OUT OVER HERE!!!
YIKES! OPEN A WINDOW!

REWARD

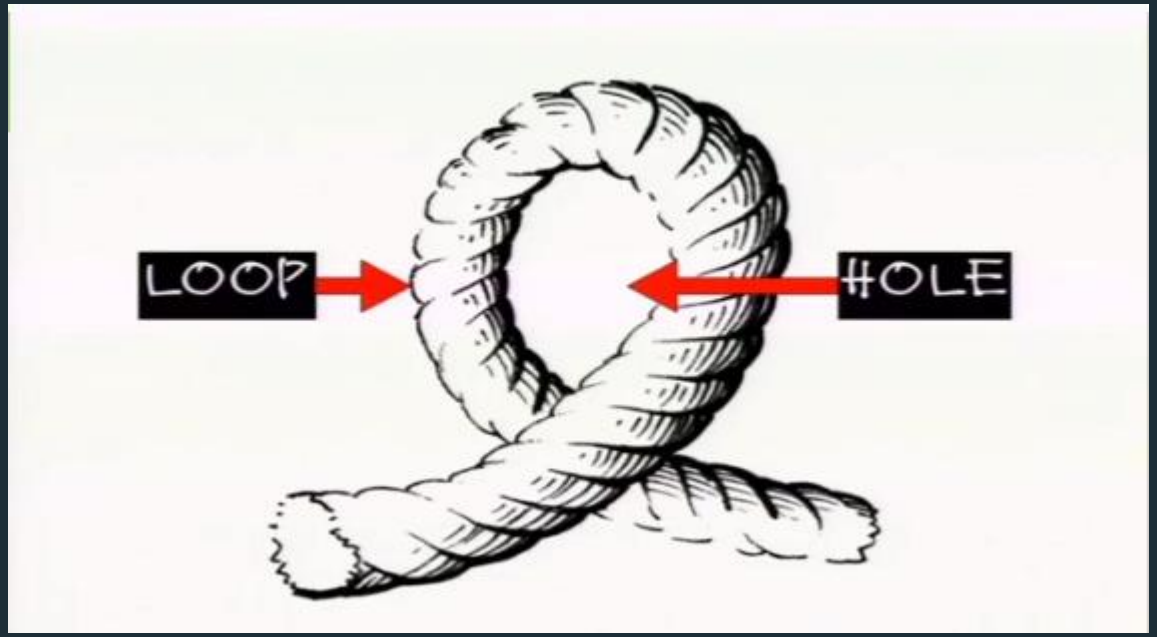

INDOOR CARBON DIOXIDE
699 ppm
2,000
1,000
800
600
400
PHEW, THAT'S BETTER
AWESOME! WE'RE BACK IN THE ZONE

What about large commercial?

65pts → 80pts

LEED v4

Performance based monitoring



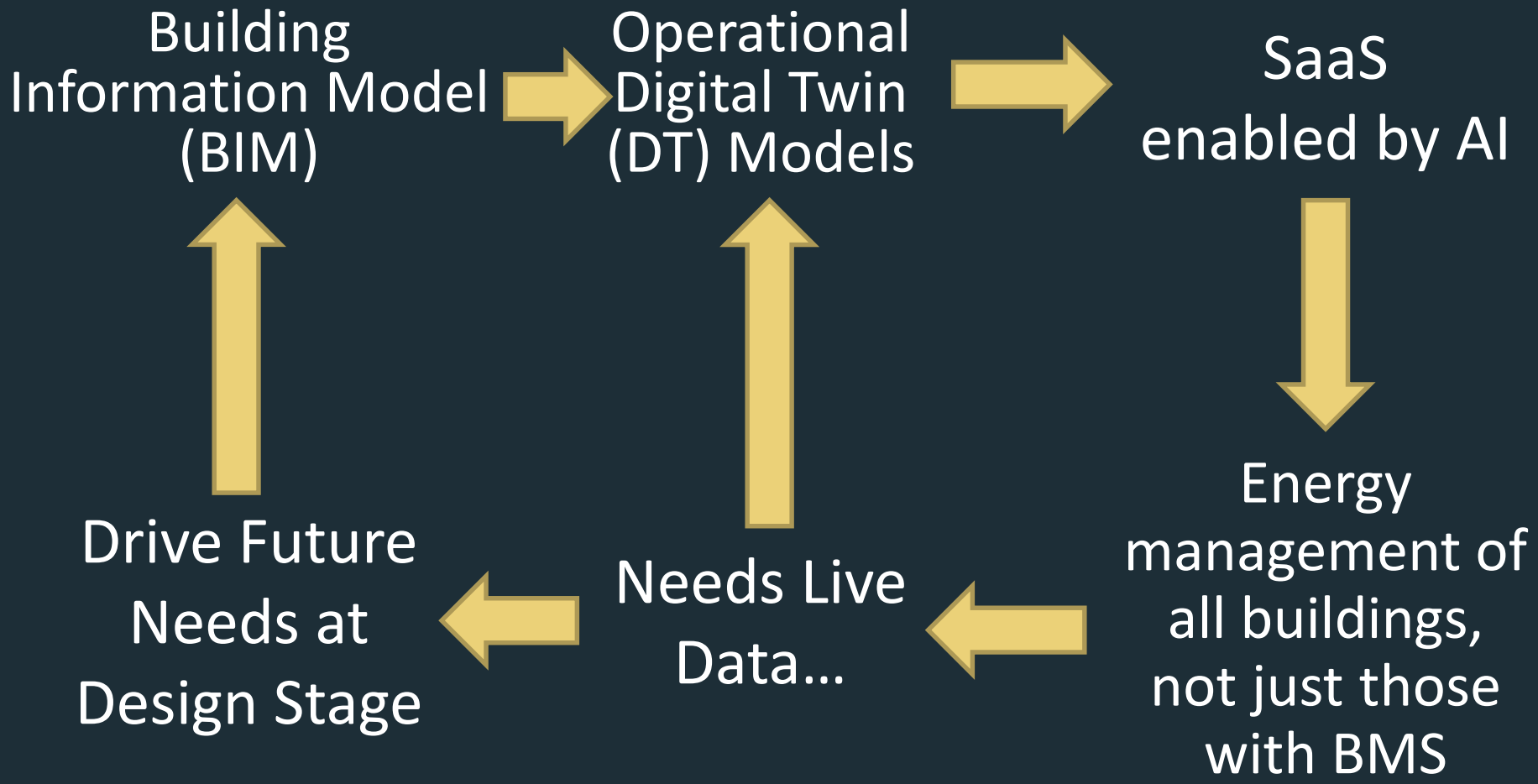
Certification is for Core and Shell…

65pts → 80pts

LEED v4

Performance based monitoring → 1pt

So how can we fix this?

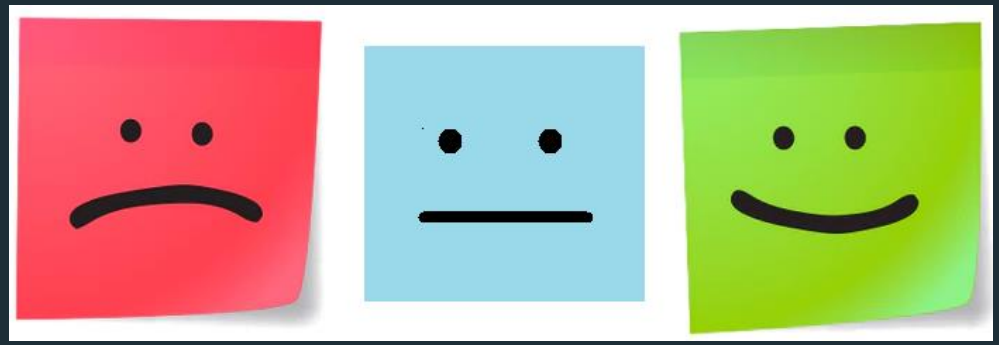

Building Information Model (BIM)
Operational Digital Twin (DT) Models
SaaS enabled by AI
Energy management of all buildings, not just those with BMS
Needs Live Data…
Drive Future Needs at Design Stage

Conservative construction sector…

Increased cost…

Unknown reward…

Will AI really help??…




REWARD
LEARNING
GOAL
ORGANIZATIONAL PRODUCTIVITY
GAMIFICATION
ACHIEVEMENT
CHALLENGE
SKILL
USER ENGAGEMENT


SOCIAL
SENTIMENT
ANALYSIS

Knowledge-driven fault detection & diagnosis implemented through AI…

In this case, we might be able to introduce AUTOMATION and take the PEOPLE into account also…

AI learns perception and comfort levels…

AI drives behaviour…

AI educates and informs…

AI allows the building to adapt to the user…

Without having a negative effect on the building energy consumption…

But what about groups of buildings?

Zero emission building stock by 2050…

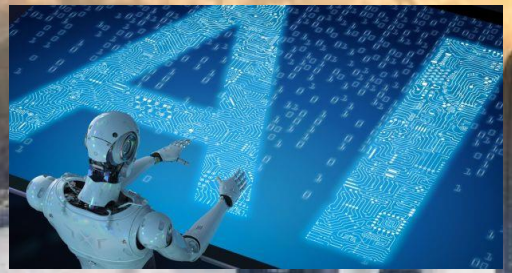
Energy efficiency target of 32% by 2030…

100 Positive Energy Districts by 2025…

100 cities have reached net zero greenhouse gas emission by 2030…

We cannot do it 1 building at a time…

Different solutions for different buildings



Some solutions can be automated, some can’t…

Demand Response and Demand Side Management…

Community Approach

Food for thought…

Watch out for the future…

Thank You