

THE MEASURE

Vol.

1

Sizing Up PropTech, Commercial Real Estate and the Modern Workplace

03

WTF is PropTech

Get an understanding of PropTech, including the main types, markets, advantages and challenges.

06

How to create a productive space

Uncover the huge range of factors that affect the way we work, from particles, to paints, to productivity paranoia.

08

Deep dives

Dive into the finer details of exactly how smart building technologies work, with a focus on IoT, digital twins and cybersecurity.

10

Top of the Props

Discover the winners of the ultimate PropTech awards: promising projects, clever companies, impressive individuals, and more.

“

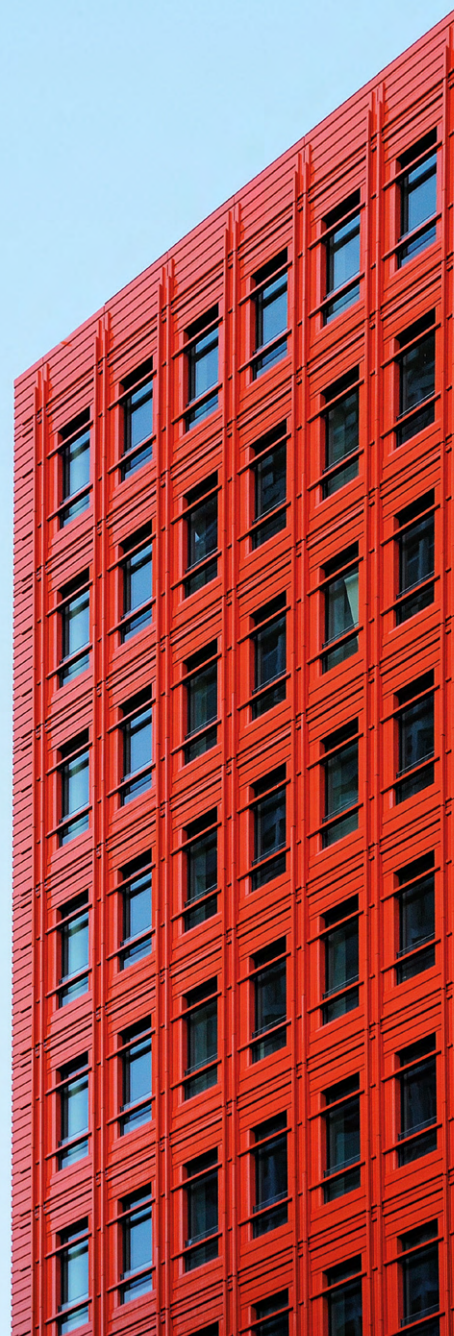
Technology is transforming Real Estate around the world, making spaces more efficient, productive and sustainable. We've put this magazine together to help you get the measure of all things PropTech.

*Charlotte Laing,
CMO at Metrikus*

An annual magazine
by Metrikus © 2023

www.metrikus.io

Cover image: London | David Rowland | 2023



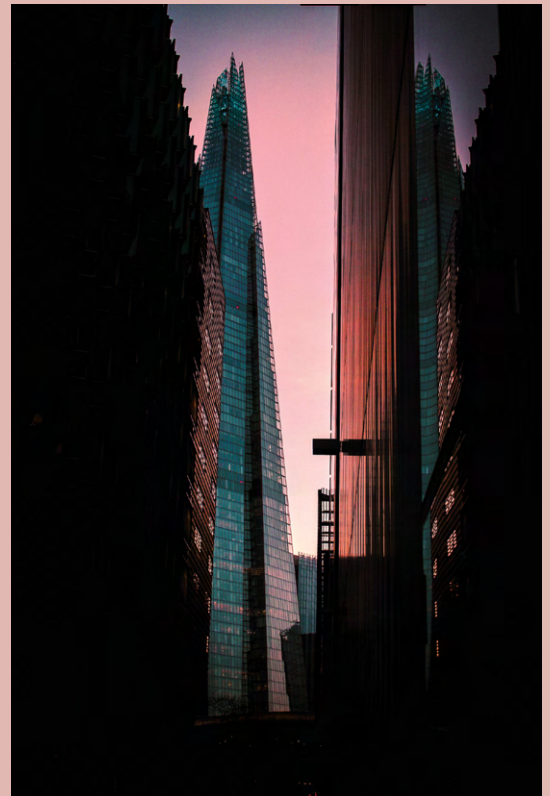
THE MEASURE



Technology is transforming Real Estate around the world, making spaces more efficient, productive and sustainable.

The Metrikus team has put this magazine together to help you get the measure of all things PropTech. With a combination of industry news, actionable learnings and insights from thought leaders, we guarantee you'll learn something new.

If you have any questions about the magazine or about PropTech in general, please feel free to get in touch with the Metrikus team: our contact details are at the end.

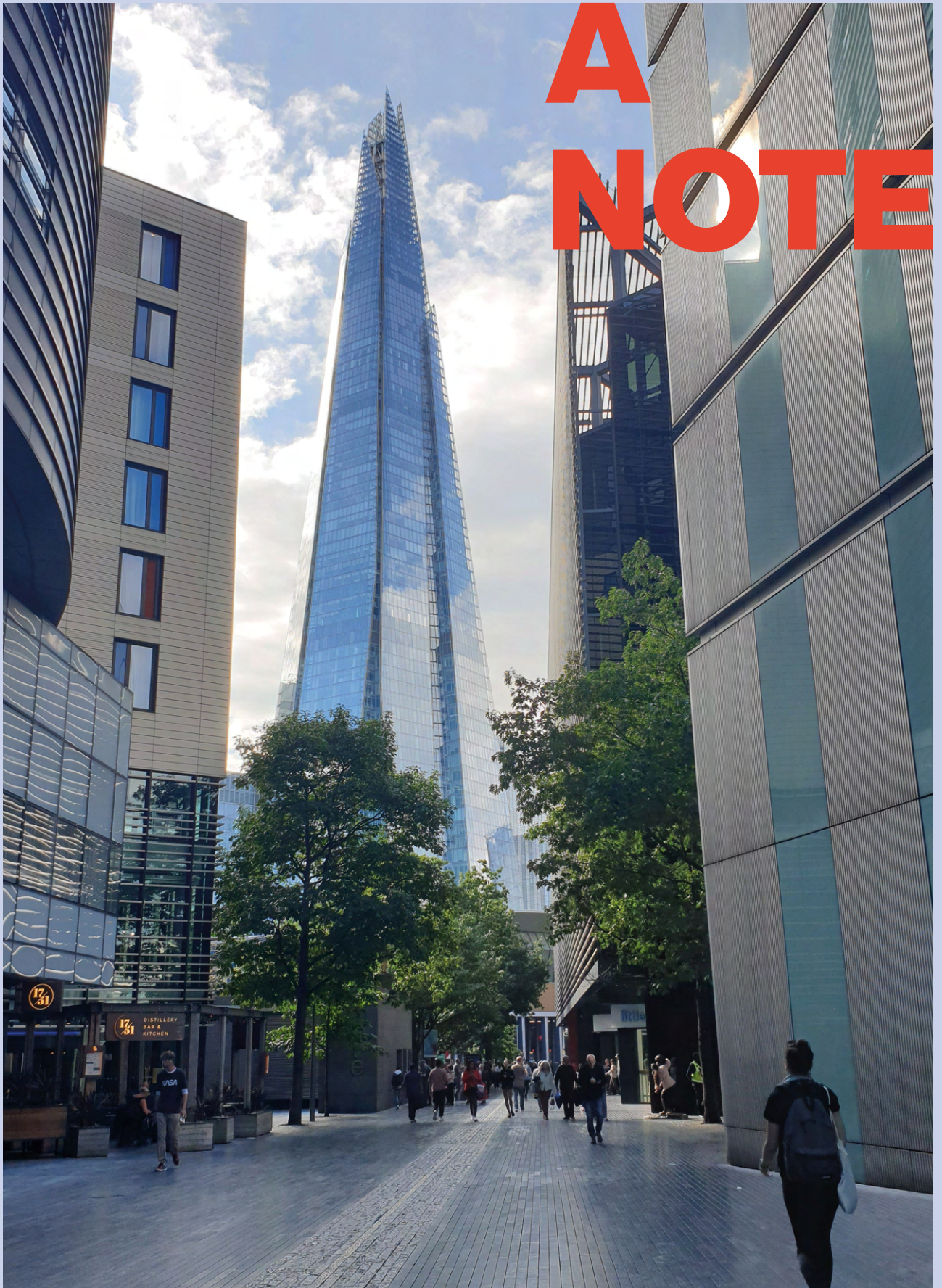


Southwark, London, UK
Photographer: Jamie Kettle

Contents:

A note from the CMO	5
2022: the year in review	6
WTF is PropTech	20
Timeline of PropTech	36
How to create an efficient space	40
How to create a productive space	70
How to create a sustainable space	110
Deep dives	146
Where does Metrikus fit into all of this?	170
Top of the Props	176
Acknowledgements	180
Sustainability matters	184

A NOTE



FROM THE CMO



Buildings are something that I grew up admiring. My father is a stonemason, which means countless summers in my younger years were spent traveling around Scotland, photographing his work on historical buildings for his website. Increasingly, I began to understand his passion for these structures.

For me this has been a year of nostalgia when it comes to buildings, as well as a renewed appreciation. The COVID-19 pandemic fundamentally changed our perspectives on many aspects of life, with Real Estate being no exception. It feels as if we have begun to view buildings through a very different lens.

Real Estate is now routinely being portrayed as wasteful. From tales of unused office space to the rise of remote work, it's clear that the view "you must be at work to work" is incompatible with this new world.

Somewhere along the way though, we have forgotten about the beauty of buildings and their importance in our humanity: they are very literally the foundations on which we build our lives! In buildings, we celebrate many of life's greatest moments, build communities, and create history. People travel thousands of miles to visit structures which are just as famous (if not more) than the places they exist in.

A balance can be found. There is an abundance of structures which are impressive beyond belief, but it is clear that 99% of buildings are not being adapted fast enough to meet our new needs. This leaves us with a daunting question: how do we achieve that?

This we don't yet have the answer to. One thing, however, is for certain: technology will play an increasingly central role. Technology is revolutionizing Real Estate globally, making spaces more efficient, productive and sustainable. With technology we now have the ability to make smarter decisions about the buildings we've created – whether it's a 16th-century castle or a 21st-century office.

And so, I am excited to introduce this magazine to help you to get the measure of all things PropTech and Corporate Real Estate. In here, there's something for everyone – with contributors from the biggest to the smallest PropTech companies, titans of Real Estate and industry VCs. Whether this is the first time you've heard the word PropTech or you've been working in the industry for years, we hope you'll learn something.

If you're going to go anywhere to understand how PropTech is changing buildings and how we use them, this should be it!



Charlotte Laing
CMO, Metrikus

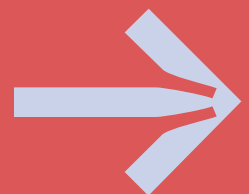
2022

the year in review



To kick things off, we're looking back on the year that was 2022: the highs, the lows, and everything in between.

Whether you look at it from the perspective of the climate crisis, technology, workplaces, ESG or Real Estate, it's safe to say it was another eventful year.



January

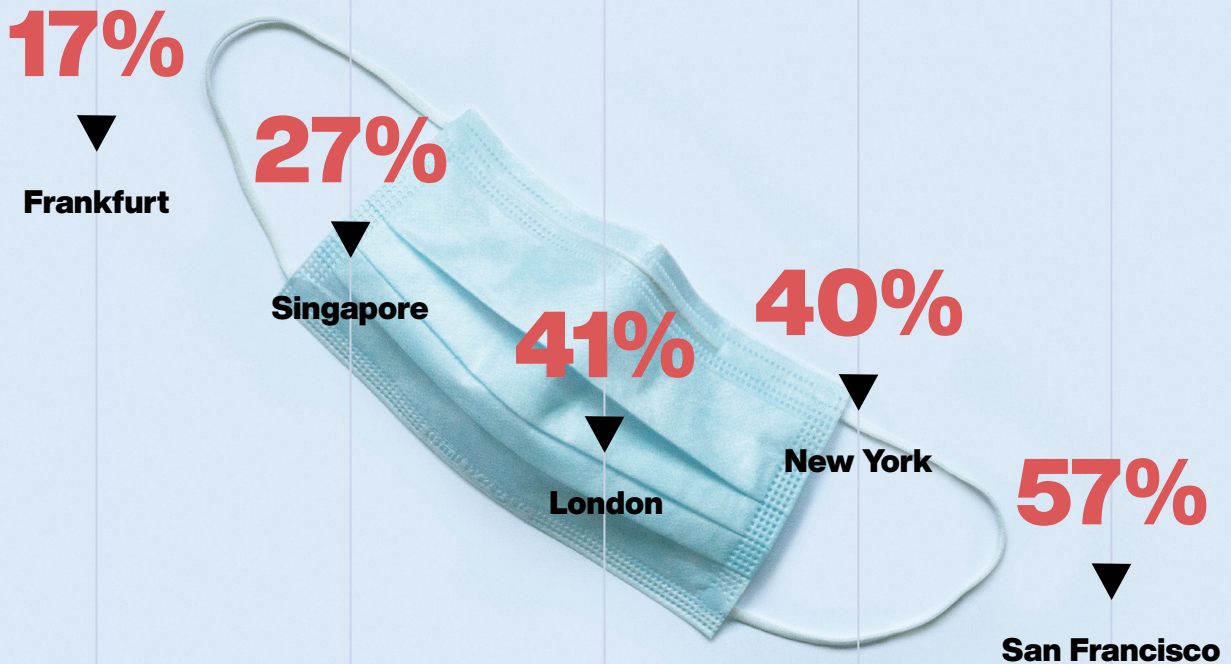
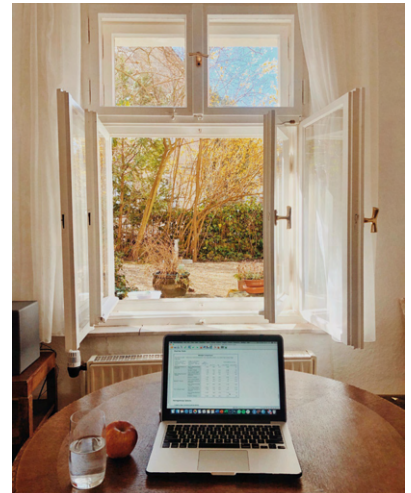
COVID-19 concerns

On 7th January, the number of COVID-19 cases exceeded 300 million worldwide. And as the pandemic continued, so too did the 'home vs. the office' dialogue.

There was a mixed response from companies around the world. Some asked employees to return to the office on a regular basis, some embraced flexibility and agility, while others encouraged

employees to stay away with the rise of the Omicron variant.

It was becoming increasingly clear that the return to the office was going to be anything but a return to 'normal'. And according to data from Community Mobility Reports, workplace activity remained well below pre-pandemic levels.



February

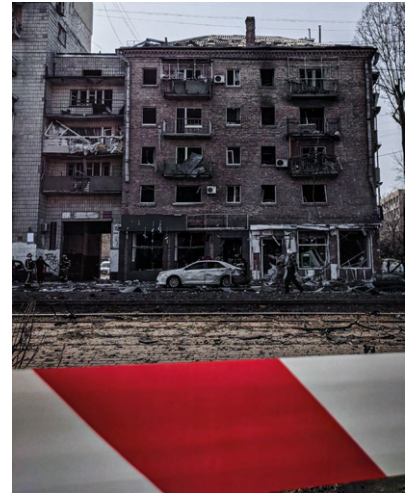
Waging war

On 24th February, Russia launched a full-scale invasion of Ukraine, spurring a wave of denunciations and economic sanctions from around the world.

Less than a day after, Meta announced it would no longer accept ad money from Russian state media outlets like Russia Today and Sputnik. Twitter said it would pause all ads from both Russia and Ukraine. And on 26th

February, YouTube also shared that it had started blocking several Kremlin-run media outlets from monetizing and running ads on their channels.

In the weeks that followed, big tech companies continued to cut ties with Russia in protest of the invasion.



15 million

Dell committed \$15 million to support Ukrainian families and later ceased all business operations in Russia

2,300

Accenture said it would discontinue its business in Russia and made plans to support its 2,300 employees within the country

4,000

DXC Technology exited the Russian market and relocated many of its 4,000 Ukrainian workers to safer areas

March

Peaking prices

In March, home prices in the US hit an all-time high, with buyers scrambling to close deals as rising interest rates started to have an impact.

The median existing-home price for all housing types was \$375,300, up 15% from the year before, according to the National Association of Realtors. This marked more than a decade's worth of consecutive year-over-

year increases – the longest running streak on record.

Existing home sales fell by 2.7% compared to the previous month and sales were down 4.5% compared to March 2021.



”

In a housing market facing affordability challenges and low inventory, higher rates are causing a pullback or delay in home purchases.

Joel Kan, Associate Vice President of Economic and Industry Forecasting for the MBA

April

Climate catastrophe

On 4th April, the Intergovernmental Panel on Climate Change (IPCC) released the final part of its climate change report. It warned that greenhouse gas emissions need to peak by 2025 and decline 43% by 2030 to give the world any chance of limiting future heating to 1.5°C above pre-industrial levels.

The UN Secretary-General, António Guterres, warned that many were making misleading claims about being on track for the Paris Agreement.



”

Some government and business leaders are saying one thing – but doing another. Simply put, they are lying. And the results will be catastrophic.

António Guterres, UN Secretary-General

The IPCC report found that:

In the next decade, climate change will drive up to **132 million** more people into extreme poverty

By 2030, an additional **350 million** people will experience water scarcity and up to 14% of terrestrial species will face high risks of extinction

By 2050, adaptation needs will reach **\$295 billion** per year for developing countries

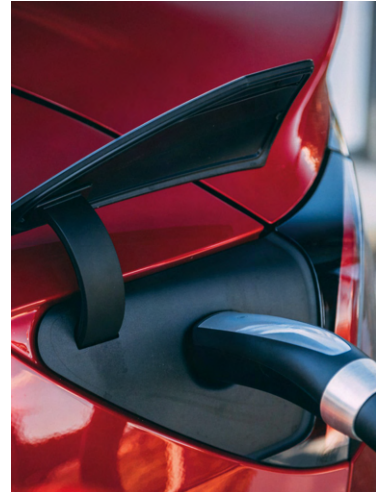
May

Greenwashing gate

In May, the world of ESG was turned on its head last week by two major events.

On 18th May, S&P Dow Jones Indices shocked Wall Street by removing Tesla from the ESG version of the S&P 500 Index. The decision kicked off a massive debate, with Elon Musk questioning how ExxonMobil Corporation, one of the world's biggest polluters, can remain in an ESG index while Tesla gets booted.

On 19th May, HSBC's Asset Management Head of Responsible Investing, Stuart Kirk, slammed the financial community for worrying too much about climate change. His remarks led to his suspension, with HSBC saying his views are 'inconsistent' with the firm.



”

Exxon is rated top ten best in world for environment, social & governance (ESG) by S&P 500, while Tesla didn't make the list! ESG is a scam.

Elon Musk, CEO of Tesla

”

Who cares if Miami is six meters underwater in 100 years?

Stuart Kirk, former Asset Management Head of Responsible Investing at HSBC

June

Better buildings

On 15th June, some major changes to Building Regulations Part F came into effect in England.

The updated regulations mean that in non-domestic new builds:

- Indoor air quality – specifically CO₂ – needs to be continuously monitored
- Whole building ventilation needs to meet a standard of 10 liters of fresh air per person per second, or one liter per second per square meter – whichever is highest
- Common spaces need natural ventilation with openings at least 1/50th of the floor area, or mechanical ventilation to supply 0.5 liters of fresh air per second per m² of the common floor space area



Want to know more?

Check out our guide with everything you need to know about Building Regulations Part F.



July

Smart stats

On 12th July, the Global Smart Buildings Market Report was published, predicting that by 2027:

The number of connected IoT devices in commercial buildings will exceed

2.5 billion



Smart building automation software and systems in North America will reach

\$20.5 billion

Smart facility water management systems will represent a market opportunity of

\$850 million



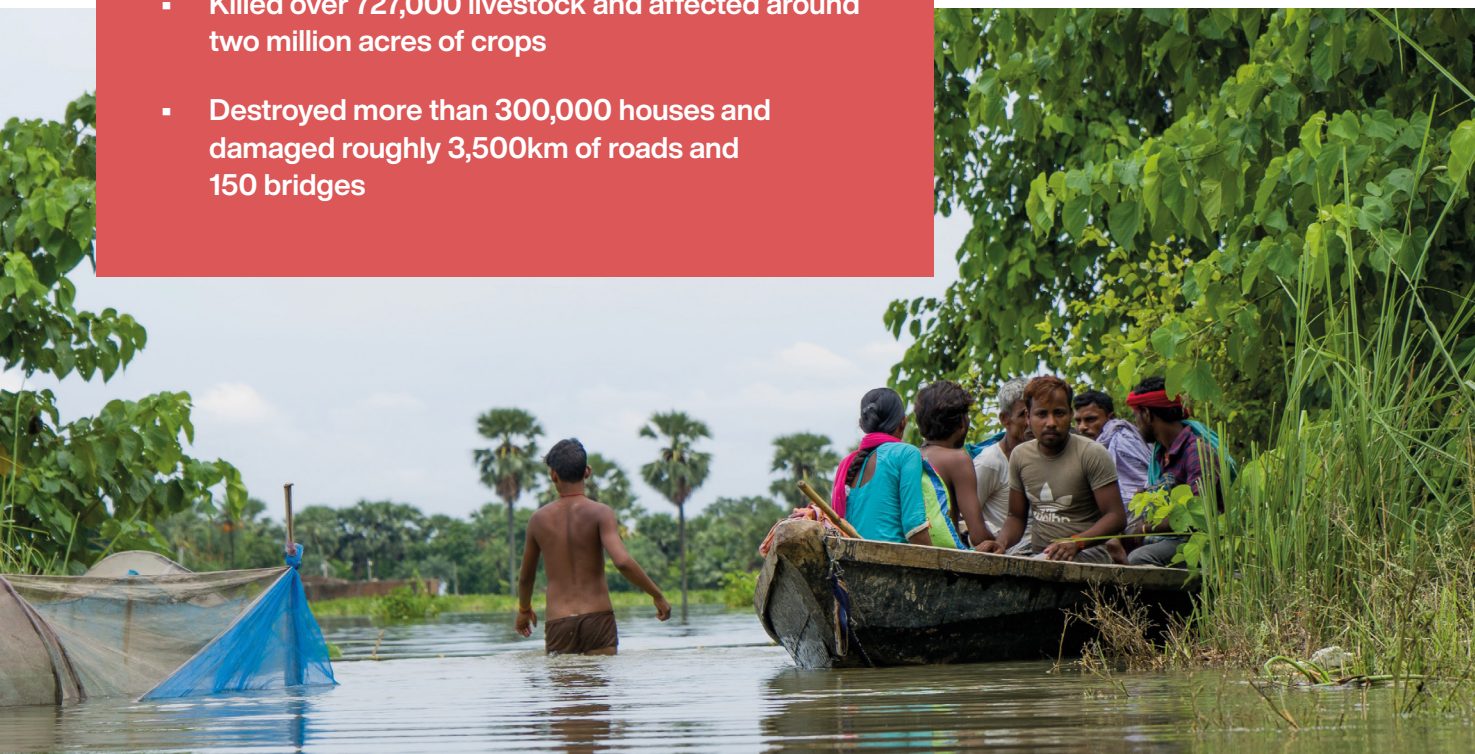
August

Frightening floods

On 28th August, Pakistan declared a 'climate catastrophe' and appealed for international assistance, as the death toll from recent flooding in the country exceeded 1,000 – the world's deadliest flood since 2017. The floods were caused by heavier

than usual monsoon rains and melting glaciers that followed a severe heat wave – all of which are linked to climate change.

- Killed 1,061 people, including almost 360 children, injured 1,575, and affected more than 33 million equivalent to nearly 15% of the total population
- Killed over 727,000 livestock and affected around two million acres of crops
- Destroyed more than 300,000 houses and damaged roughly 3,500km of roads and 150 bridges



Energy emergency

During September, governments across Europe announced a range of measures to reduce energy consumption amid fears of a difficult winter ahead.

France

The Eiffel Tower began plunging into darkness over an hour earlier than normal, while shops and buildings started lowering thermostats and shutting off lights at night.

Germany

It was announced that offices would only be heated to 19°C (66.2°F), and buildings and monuments wouldn't be lit up at night unless necessary.

Spain

Spain introduced limits on air conditioning and heating temperatures in public buildings and large commercial buildings.

Czech Republic

The Czech Government installed movement sensors to cut down lighting in corridors and turned off the floodlights at the iconic Prague Castle at 10pm instead of midnight.

Denmark

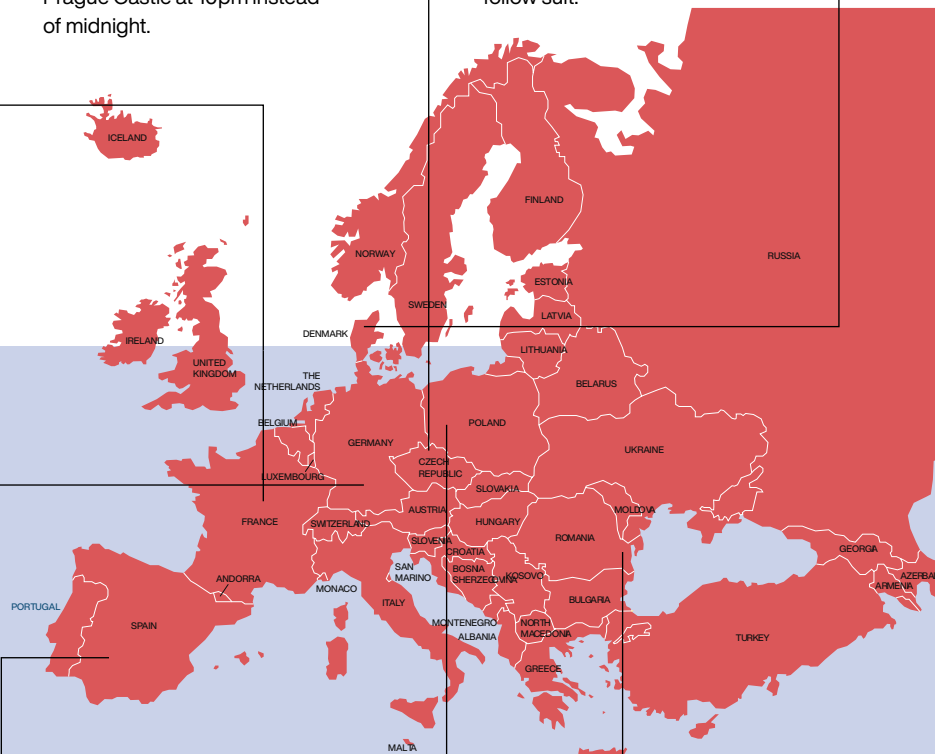
The Danish Government introduced a heating cap of 19°C (66.2°F) in all government buildings and encouraged private organizations to follow suit.

Poland

Officials were ordered to turn off their computers and disconnect chargers after work, and only print documents if absolutely necessary.

Romania

Lights were switched off at Romania's Palace of the Parliament, the heaviest building in the world and the second largest building in the world after the US Pentagon.



October

IAQ improvements

On 11th October, the Biden Administration convened a group of leaders, experts and advocates at the White House for its first ever summit on indoor air quality (IAQ).

The administration also launched an updated 'Clean Air in Buildings' website with loads of helpful resources and information on how businesses can participate in the 'Clean Air in Buildings Challenge' that kicked off earlier in 2022.

During the event, speakers discussed ways of ramping up efforts to improve indoor air quality, not just to prevent the spread of infectious diseases like COVID-19, but to improve public health.



”

**We need healthy buildings
because we need healthy
communities.**

Dr. Ashish Jha, White House
COVID-19 Response Coordinator



November

COP27 conversations

From 6th to 20th November, COP27 took place in in Sharm el-Sheikh, Egypt. There were times when it looked like a final deal might never happen, but a breakthrough was eventually made and the decision was signed off by nearly 200 countries – from major polluters to small island developing states.



There was little progress on phasing out fossil fuels

The final COP27 deal drew some criticism for not doing more to rein in climate-damaging emissions. While the deal text called for efforts to phase down use of unabated coal power and phase out inefficient fossil fuel subsidies, some countries had pushed to phase out, or at least phase down, all fossil fuels.

A fund for climate change was agreed

After years of resistance from rich governments, nations agreed to set up a fund to provide payouts to developing countries that suffer 'loss and damage' from climate-driven storms, floods, droughts and wildfires.

Brazil was back in the game

Luiz Inácio Lula da Silva was greeted by roaring crowds as he declared 'Brazil is back' in the global climate fight, and vowed to host COP30 in 2025 in the Amazon region.



”

We must stop this rush to the abyss. There is no climate security for the world without a protected Amazon.

Luiz Inácio Lula da Silva,
President of Brazil

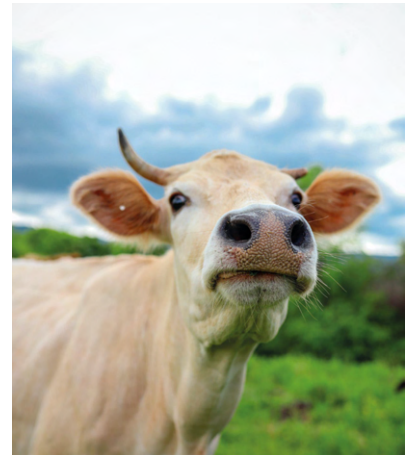
COP27 conversations continued

The relationship between the US and China was rekindled

As COP27 entered its second week, China's President Xi Jinping and US President Joe Biden met in Indonesia for the G20 to restart cooperation on climate change after a month of tensions over Taiwan.

Adaptation played a more prominent role

The Egyptian Presidency launched the Sharm-El-Sheikh Adaptation Agenda in partnership with the UN Climate Change High-Level Champions, and the Marrakech Partnership. The Agenda is basically a global to-do list to improve the resiliency of more than four billion people against climate-related risks, with 30 'adaptation outcomes'.



The Global Methane Pledge reached 150 nations

The US and EU – the joint leaders of the Global Methane Pledge – announced new joiners during COP27. There are now 150 nations committed to reducing methane emissions by at least 30% by 2030. Notable absences include Russia, India and China, but China has said it will publish its first national methane plan in the near future.



Promising predictions

As always in December, there was a wave of industry predictions for the upcoming year. We've picked out some of the most interesting ones so that we can revisit them this time next year and see if they were on the money or way off the mark.



VR and AR

Real Estate listings with 3D virtual walkthrough close 31% faster and sell for up to 9% more (Matterport, 2020). Going forwards, the use of VR and AR in Real Estate will continue to expand, especially among investors and in the rental business.

AI-enhanced analytics

The global quantum computing market size is forecast to expand from \$470 million in 2021 to \$1,765 million in 2026, and this is just the tip of the iceberg (Analytics Insight, 2022). More and more PropTech startups will apply quantum in their algorithms as the technology continues to develop.

Streamlining of all processes

While a lot of PropTech applications currently cover different aspects of Real Estate, there will be a surge in comprehensive platforms that take a certain niche or cover everything. There's a lot of potential in streamlining processes as the demand is huge among Real Estate professionals.

Fractional ownership

Previously with fractional ownership, investors needed to have solid amounts of initial capital to get started – most REITs have a minimum capital requirement of \$25,000 in addition to working only with accredited investors. Going forwards, there will be an increasing number of PropTech platforms that allow investors to invest in parts of Real Estate properties with smaller investments, giving more people access to investing.

The metaverse

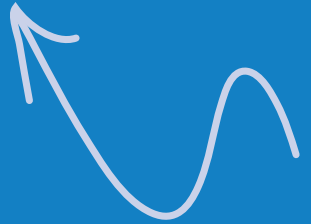
The global metaverse Real Estate market alone was valued at \$821.9 million in 2021, with a projected increase to \$5.95 billion by 2028 (Vantage Market Research, 2021). This growth will be supported by developments in other Real Estate tech trends like VR, AR and blockchain technology to Real Estate. However, buying assets in a virtual world is still a relatively new concept, so investors will still proceed with caution.



WTF



is PropTech?





- *WTF is PropTech?* 22
- *WTF are CRETech, CouTech and FinTech?* 23
- *WTF is IoT?* 23
- *Why has PropTech become so important?* 24
- *What are the main types of PropTech?* 25
- *What are the key PropTech markets?* 26
- *What are the advantages of PropTech?* 30
- *What are the challenges of PropTech?* 32
- *What is next for PropTech?* 33



WTF is PropTech?

At Metrikus, we talk about PropTech day in, day out, but every now and then we come across someone who asks us “WTF is PropTech?” We don’t blame them – there’s so much jargon flying around it can be hard to keep up with every new term that comes along.

So, before we get into the nitty gritty of our content we thought we’d cover the basics to avoid any confusion.

PropTech is an abbreviation of ‘property technology’ and it’s basically any technology that relates in some way to buildings. It encompasses a huge range of solutions that optimize the way

people research, rent, buy, sell, and manage a property. This could be anything from reducing paperwork for property management, to streamlining transactions between tenants and landlords, to helping building owners manage their assets more efficiently.

The main goal of PropTech is to make owning, leasing, or operating a building easier for everyone involved.



WTF are CRETech, ConTech and FinTech



CRETech

CRETech is – yep, you guessed it – Commercial Real Estate technology. It's often used synonymously with PropTech but PropTech includes both commercial and residential technology, while CRETech focuses solely on commercial.

FinTech

FinTech – AKA PropTech's older brother – is short for financial technology and it's all about using innovative digital methods to provide financial services. Examples of FinTech companies include mobile banking platforms and online tools that help you pay friends.

ConTech

ConTech is the construction technology that's changing the way we build, including things like 3D printing and aerial mapping performed by drones.

WTF is IoT?

While we're talking about different types of tech, we thought it'd be worth adding a quick definition of IoT, short for the Internet of Things, as it has a massive role to play in PropTech.

IoT is the global network of physical assets – 'things' like sensors and devices – that are connected by the internet. These 'things' are used to monitor the world around them and to collect and exchange the resulting data.


What makes these assets smart is that they can 'talk' to each other over the internet. Some 'things' collect and send information, some receive information

and act upon it, and some can do both. The data that is collected and analyzed by IoT can help us make more informed, efficient and meaningful decisions.

Technically, any device connected to the internet is part of the Internet of Things – whether it's a CCTV camera, a blood pressure monitor or even a baby monitor. But when it comes to PropTech, we're mainly talking about sensors that connect buildings and transform the way they operate.

Had enough of portmanteaus and abbreviations for one day? Don't worry, so have we – let's dive into the growth of PropTech.





Why has PropTech become so important?

Real Estate is the world's biggest asset class, worth a whopping \$217 trillion (Adfenix, 2022). In fact, global Real Estate is more valuable than all the stocks, shares and bonds in the world combined.

Today, the Real Estate sector is facing significant challenges and opportunities.

1. Continued impact of COVID-19
2. Inflation and interest rates
3. ESG and net zero objectives
4. Housing affordability
5. Changing ways of working and living
6. New technologies
7. Supply chain disruption
8. Weather-related risks
9. Labor shortages
10. Cybersecurity

PropTech can help a notoriously old school industry to evolve and respond to the changing times.

What are the main types of PropTech?

There are loads of PropTech startups offering innovative solutions across every aspect of the Real Estate industry, both residential and commercial.

In fact, the global PropTech ecosystem is so vast and eclectic that it is really hard to pick out just a few main types, but here goes!

Whether you're researching, renting, buying, selling or managing a property, there's bound to be a useful PropTech solution for you.



Residential

- Property search platforms and sale tools – listing, marketplaces, real estate agent tools
- Financing tools – digital lenders and brokers, alternative financing
- Mortgage lender software – loan application and management
- Real Estate closing tools – insurance and transaction management
- Property management tools – IoT technology
- Loan management systems – loan securitization



Commercial

- Property search platforms – listing, marketplaces and brokerage management software
- Constructions planning and management tools
- Evaluation and financing tools – transaction underwriting and management, debt financing platforms
- Property management tools – IoT technology
- Asset utilization – co-working and co-living spaces management, retail and industrial buildings management

What are the key PropTech markets?

PropTech is a global industry, made up of lots of regional markets.



North America

North America is a leading region in the PropTech market, expected to grow from \$18.2 billion in 2022 to \$86.5 billion in 2032 (FMI, 2022).

There are PropTech companies thriving in the commercial, residential, and retail sectors, with key hubs dotted throughout the continent.

New York leads the way
in commercial PropTech – especially office space – and is also a major base for PropTech's crossover with FinTech.

Seattle is home to lots of
big tech leaders and PropTech companies, including one of the most talked about software platforms, Porch.

Silicon Valley in California
is the most influential technology region in the world, which makes it prime for PropTech innovation

Europe

Along with North America, Europe has an influential PropTech scene. The UK leads the way, with London widely regarded as the center of the PropTech world. We're not surprised, considering Metrikus was founded there!

Germany, Norway, France, Switzerland and Spain are also key players, with the Netherlands recently becoming an unexpected hotbed of innovation and disruption.

Despite the pandemic and the uncertainty that investors and companies faced for several months, the European proptech market had a record year in 2021. It accounted for around 20% of global PropTech investment, with €3.8 billion of venture capital investment across more than 200 deals (Property Week, 2022).

"Despite the pandemic and the uncertainty that investors and companies faced for several months, the European proptech market had a record year in 2021."

Australia

The Australian Real Estate market is one of the most proactive in the world, with hundreds of companies garnering serious attention from around the globe.

The Australian PropTech Industry Map by PropTech BNE shows the sectors that are leading the way in the area.

- **23.2%: Residential Real Estate**
- **19.9%: Property management**
- **15.8%: Commercial Real Estate**

Latin America

Latin America is one of the world's emerging PropTech markets. After being slower to adopt for a long time, the region is now home to some really cutting edge solutions.

By 2019, there were already 350 PropTech companies in Latin America, out of which 225 were located in Brazil (Statista, 2022). There's also been a rising number of PropTech events in Latin America, including Mexico, Argentina, and Chile.



Africa

Africa is rapidly emerging as a PropTech hub, with a wide range of innovative startups popping up around the continent. There are two nations currently leading the way – Nigeria and South Africa.

Nigeria

PropTech in Nigeria is still in its infancy, but there are several factors that makes the area primed for growth:

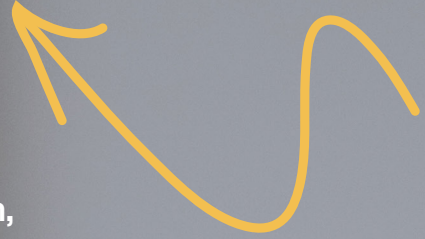
- **Government involvement to promote innovation and entrepreneurship**
- **Significant funding to improve infrastructure and facilities**

To date, the largest tech adoption has been in listings and rent payment – which is an interesting development as rent in Nigeria has traditionally been paid annually.

South Africa

The South African Real Estate industry is worth around \$10 billion, so it's no surprise that PropTech is booming in the area (Unissu, 2022).

One of the most well-known startups in the area is Flow, a platform that rewards tenants for registering, adding their property details, paying their rent on time, and looking after their homes.



Asia

China is currently leading

the Asian PropTech market, and is well on its way to becoming a leader in the global market, expected to have a CAGR of 23.7% through 2032 (FMI, 2022). With an enormous population and increasingly influential economy, it's definitely one to watch in the next couple of years.

Singapore is another

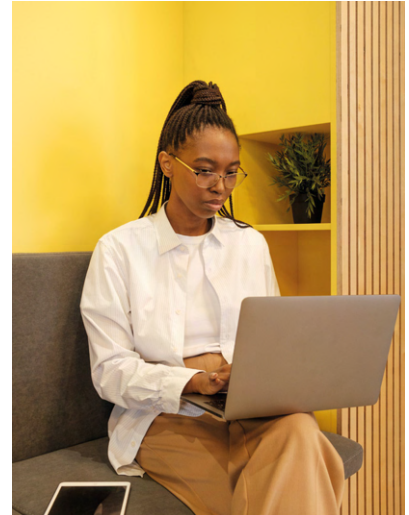
Proptech hotspot, home to a number of high profile companies like Propseller and Ohmyhome.

Other exciting markets in Asia include South Korea, Indonesia and Japan – which is now home to more than 50 PropTech companies.



What are the advantages of PropTech?

We could go on and on about the advantages of PropTech, but for the purposes of this magazine, we've picked the top 10 to share with you.



1.

Save time

Gone are the days of paper documents, face-to-face transactions and hands-on maintenance and repair. PropTech removes hassle, streamlines processes, and makes every aspect of Real Estate more efficient.

2.

Save money

With efficiency and automation comes increased profit margins. PropTech solutions provide valuable insights and generate a big return on investment.

3.

Increase value

PropTech not only saves you money, but also helps you to make money, as tenants and customers are willing to pay higher rates for smart, healthy and sustainable buildings.

4.

Improve energy efficiency

As we're on the brink of a disastrous tipping point in the climate crisis, PropTech is on hand to make buildings around the world more efficient and sustainable.

5.

Manage multiple buildings

When you own or manage multiple buildings, it can be difficult to be present on-site to make key decisions. With PropTech, all you have to do is open your laptop or smartphone, visit your management dashboard, and check how each of your buildings is performing.

6.

Decrease maintenance costs

PropTech automates maintenance work, like reconfiguring HVAC systems, turning lighting on and off, monitoring appliances, and securing the premises.



7.

Reduce downtime

Smart building software can predict when equipment is about to malfunction, reducing downtime and ensuring any faults are resolved quickly. This can be particularly useful in places like data centers, when any downtime can result in a huge loss of revenue.

8.

Enhance promotion

From floorplans and galleries to online tours, the expansion of 3D virtual tools is helping Real Estate agents to effectively promote existing properties and upcoming developments. This was especially important at the height of COVID-19, when it became next-to-impossible for transactions to take place along normal channels.

9.

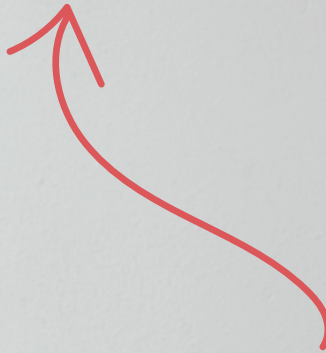
Improve communication

Lots of PropTech companies focus on improving communication between landlords and tenants. With fewer misunderstandings and faster answers, everyone's a winner.

10.

Increase transparency

New technologies like big data and blockchain have an important role to play in increasing transparency. PropTech can ensure that all stakeholders have access to accurate data and visibility over every aspect of a transaction.



What are the challenges of PropTech?

Proptech brings about a range of regulatory and legal challenges that need to be considered.

Most emerging technologies rely upon – or create – significant amounts of data. This can lead to issues relating to data protection and intellectual property, as well as harnessing data as an asset.

To ensure legal and regulatory compliance, companies need to consider how data is obtained, cleaned and processed.

There are also lots of legal issues related to specific technologies. For example, blockchain involves storing data on the ledger irreversibly, which is against the principles of data protection. This kind of thing needs to be addressed up front when implementing blockchain-based solutions.

How can we increase data security?

Encryption protocols

Technology manufacturers need to use best practice industry guidelines around security, and administrators should use the latest encryption protocols, using unique and complex passwords for access and validating the SSL certificates of remote systems.

Standardization

Establishing a unified technical standard is key to achieve maximum compatibility between different devices and platforms. This improves data integrity and removes barriers to information exchange.

Legislation

Legislation is the most practical way to guarantee the privacy of systems and make smart technology more secure.



Transparency

Technology providers need to demonstrate their commitment to privacy and anonymity when it comes to handling user data. It's essential that they can show that they are only using it for strictly necessary purposes, and doing everything they can to maintain user privacy.

Consumer awareness

On the flip side of the coin, consumers should make sure they are aware of the data they are sharing and how it might be used by the company in question.



What is next for PropTech?



The PropTech market is smart, innovative and growing rapidly, with companies raising a record-breaking \$32 billion in 2021 globally (Creti, 2022).

Experts say that the sky's the limit for the future of PropTech. So, the question is: what next?

Here are some of the biggest trends we'll be keeping an eye on in 2023 and beyond.

Old Street roundabout, London, UK
Photographer: Jamie Kettle

In the coming years, PropTech solutions will continue to disrupt the Real Estate industry and change the world for the better. And as a PropTech company ourselves, we're excited to see what the future holds.

- 
- 
1. ESG and sustainability
 2. Multifamily innovation
 3. Virtual and augmented reality (VR/AR)
 4. Artificial intelligence and machine learning
 5. Biometric data
 6. Smart homes
 7. iBuyers
 8. EV charging infrastructure
 9. 3D printing
 10. Blockchain



WHAT WE'RE SEEING IN THE PROPTech SPACE

Ivo Van Breukelen,
Managing Partner at The PropTech Connection



Ivo van Breukelen is one of the Managing Partners of The PropTech Connection, the leading global PropTech advisory which helps global VC funds, Real Estate companies and PropTechs by sharing global market insights about the PropTech ecosystem. Ivo is a global leader and has one of the most sophisticated networks globally in sourcing some of the best technologies in PropTech, allied with his extensive international experience, gives him an unrivaled vantage point to what's going on in the market. Ivo has also presented guest lectures at MIT (2022), Harvard (2019) and keynotes at some of the leading global PropTech events and private c-suite gatherings.

1.

The dramatic shift into ESG

What we're seeing in the market and what we hear a lot from our institutional relationships is that it's not necessarily about investing in the next

best deal. It's more about implementation, finding solutions for clients tomorrow.

How can we leverage technology as a customer, to use it in our assets, to find efficiencies and solve (commercial) problems. Real Estate is bespoke and needs curated solutions.

2.

The rise of the in-house venture arm

PropTech is very broad and is hard to define due to the number of elements within it, which is a challenge from an investment point of view, meaning there is a lot of wasted time from PropTechs approaching funds that don't invest in that technology or at that stage.

We've started to see a lot of corporate venture capital firms coming in. There's obviously a lot of well established and well known PropTech venture capital funds, but we're

starting to see a lot of large Real Estate companies, as well as other corporates, actually setting up their own in-house investment arms where they're looking for strategic investments.

3.

Despite volatility, there's still capital that needs to be deployed

2022 has been shaped by a lot of volatility in the (public) markets. That obviously has a direct impact on VC funding as everybody is 'risk-off', thus decreasing the likelihood of receiving capital from LPs. We are seeing a lot of interest, primarily from Asia Pacific wanting to enter the PropTech market.

We really think the MENA region is fantastically placed to drive some of the next waves of innovation in PropTech. Supply chain costs (shipping costs earlier in the year were at 5x what they were last year) plus energy usage plus digital construction

techniques, we feel will be next on the immediate horizon. The MENA region has some enormously innovative and large enterprises who can fund and deploy solutions to overcome these issues.

4.

Secondary avenues

A lot of what we would call the high quality deals are looking not only for next funding rounds, but are often-times also running a second trajectory for an M&A play should they not be successful to raise funds (in a timely fashion). We at the PropTech Connection are increasingly being approached to extend the network reach for strategic growth initiatives. We always highlight to our clients that there's always pockets of capital or relationships that you do not know, or do not have access to. That's where we step in and make a difference.

5.

Consolidation is key

We're starting to see the first 'category winners' presenting themselves. That means that there will be significant consolidation opportunities across the market. PropTech is highly fragmented and you'll start to see that some large players are going to bring it together.

6.

A global appetite

We believe that some of the very well-known Silicon Valley corporates are looking to make a significant play in the PropTech ecosystem.



So what does the global PropTech market look like for 2023?

We always look at the PropTech market from a macro lens. Europe is effectively on a very tough trajectory, and still has some pain in the foreseeable future. We're seeing excitement in the APAC region, India for example has almost 3,000 PropTechs. This is going to be one of the more promising markets.

Tips for raising in the current market

Investors are looking at fundamentals more closely than ever: longer run rates, looking into commercials/revenues etc. You want to make sure those metrics are extremely solid.

It's really important to be prepared and start in timely fashion. We think it's important that you need to make sure that you have a network with advisors and other relationships that can help you widen your reach. There's a lot of '2nd or 3rd tier capital', not by function that it's less relevant, but simply less known and you want to find the best possible partner for your growth trajectory considering your strategy.

Make sure that collateral is impeccable: we still see a lot of decks and financial models that are poorly executed. We always remind our network that you only get one shot in front of an investor or customer, to leave that first impression.

Make sure you have the runway, make sure that everything is lined up correctly, make sure that you have that wide reach as well and work on the fundamentals.



1940s

The idea of smart buildings emerges with the invention of transistors



1980s

Spreadsheet applications are popularized, with Excel becoming an industry standard for the organization and analysis of data

1984-87

1984: Yardi is founded, providing leading software solutions for Real Estate

1987: CoStar is founded, providing information, analytics, and marketing services for Real Estate in the US, Canada and Europe



...

...

...

...

...



1977

The Apple II is invented. Being one of the first successfully mass produced computer products in the world, it drove the development of the PropTech 1.0 era

1982

The Property Market Analysis (PMA) is founded in London, developing and selling PC-driven property research.

NCREIF (National Council of Real Estate Investment Fiduciaries) establishes a property index for the US to measure and track the performance of real estate investments and evaluate the rate of returns in the market



NCREIF

PropTech 1.0 | 1980 to 2000

Characterized by the emergence of computing power and access to data

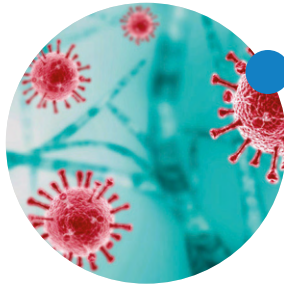
2005-07

2005: Trulia is founded in the US

2006: Zillow is launched in the US

2007: Zoopla is launched in the UK, reinforcing the scale, influence and development of the online property market

ZOOPLA



2020

The COVID-19 pandemic causes the emergence of technologies used to adapt to the changing climate, making spaces safer and healthier

3D and virtual property tours gain popularity

Occupancy monitoring solutions are deployed at scale to prevent overcrowding and encourage social distancing

Indoor air quality and smart cleaning solutions are used to maximize health and safety in workplaces

2015

PiLabs is founded in London as the first European VC to invest exclusively in the PropTech vertical

2000

rightmove

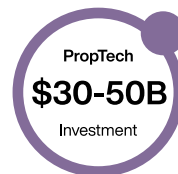
Rightmove is founded in the UK by the top four estate agencies at the time. This marks the beginning of the online residential market sector, and of the PropTech 2.0 era

2010

Early 2010's: PropTech 2.0 is driven forward by a huge spur in startups backed by venture capitalists pumping money into the industry, aiming to innovate Smart Real Estate, Real Estate FinTech, and the Sharing Economy

2017

Over 2000 PropTech startups have now been established, collectively raising an estimated \$30-50 billion in funding



Future

Innovations through emerging technologies. Big data, artificial intelligence, blockchain, augmented and virtual reality.

What role will they play?

PropTech 2.0 | 2001 to Present

Driven by explosive waves of innovation and investment

PropTech 3.0

What will the future look like?



THE STATE OF COMMERCIAL REAL ESTATE

Michael Beckerman,
CEO at CREtech



Michael Beckerman is the CEO of CREtech, the largest global consulting, media and conference company devoted to technological innovation in the Real Estate sector. CREtech's mission is to help the industry embrace, adopt and future-proof their businesses to inspire the next generation of ideas, processes and people to champion the world's largest asset class. Beckerman also leads CREtech's newest initiative, CREtech Climate, which is the 'voice' of the Real Estate industry's commitment to climate tech.

What are the biggest trends impacting the Real Estate industry today?

According to PwC's 'Emerging Trends in Real Estate 2023', the Real Estate industry is currently facing opposing forces – certain segments of the industry are reverting to pre-pandemic norms, while others are coming to accept the new norm, with potentially permanent shifts.

Some of the most impactful trends are workforce transformation – whether workers will return to the

office or continue with a hybrid, or work from home format. How these ultimately play out are likely to result in office asset repurposing at scale. Forecasts indicate that between 10-20% of offices may either need to be repurposed or face redundancy.

Rising high up on the agenda is climate change. The Real Estate industry is coming under increasing pressure from regulators, investors and corporate occupiers to take action and place sustainability at the fore.

On a positive note, this presents an opportunity for Real Estate to address:

- Carbon emissions from operations
- Physical asset protection and risk mitigation measures from the ravages of climate change

Whilst these sustainability principles may be broadly categorized under ESG, the latter is focused mainly on the 'E', or environmental aspect. Tying into this equation is the 'S', or societal element.

The global housing affordability crisis is also increasingly gaining prominence – rightfully so, as it too needs urgent addressing. Reverting back to Economics 101, while there are many reasons underscoring housing affordability, the most fundamental is a critical shortage of supply. Although this is a massive challenge, this too presents itself as an opportunity to the Real Estate and PropTech realms, with innovation in 3D printed housing, modular (off-site) construction and many other great examples of ingenuity presenting themselves in the marketplace.

Throughout 2022, capital markets generally favored other asset classes, such as equities and bonds. This is a result of the high probability of an impending global recession, and factors fueling Real Estate industry headwinds – such as rising interest rates and record high energy prices culminating in lower expected returns from Real Estate.

A few other noteworthy trends emerging in Real Estate include the use of blockchain technologies, the

metaverse (for good or bad?) and construction technologies.

How can we decarbonize Real Estate?

Holistically, three main clusters of the built environment require addressing:

1. **Carbon**
2. **Waste**
3. **Water**

When it comes to carbon, the sustainable building market is often viewed as bifurcated, with solutions either addressing existing buildings through energy efficiency retrofits, or targeting embodied carbon through the construction and design of net zero carbon buildings.

Building decarbonization tools are continually gaining breadth and depth through innovation, and these tools can be understood by categorizing them into passive and active solutions. Passive solutions include double or triple glazed windows, insulation, and thermal aspects, such as solar photovoltaic panels. Active solutions include HVAC system upgrades, geothermal and air heat pumps, as well as the replacement of inefficient energy appliances.

It should not go unmentioned that a range of smart building software solutions that address energy efficiency optimization, for example, through artificial intelligence and machine learning, are also establishing their market presence.

Advancements in sustainable buildings and building materials for the construction of green, new buildings range from eco-friendly, carbon-neutral concrete, to mass timber, prefabricated modular construction and 3D printed homes.

What are the biggest barriers for PropTech adoption? How can these be overcome?

While ESG principles have emerged and indeed are being embedded into the Real Estate industry, broadly, by virtue of the nature of their operations, Real Estate companies are profit seeking entities.

According to a 2021 survey conducted by Yardi and the European Real Estate Association (EPRA), nearly 50% of Real Estate companies that have adopted PropTech tools cite a lack of ROI as their biggest barrier in considering further investment and implementation.

Other key takeaways include:

- In-house digital strategies
- Lack of champion users – with the two operating symbiotically, hand-in-hand, tend to improve the impact of adopting technology on company performance
- Around 25% of respondents claim that they would rather opt for in-house solutions to address pain points
- Platform approaches are preferred to point solutions – typically representative of the broader, disparate PropTech ecosystem
- The biggest hurdle (46%) is simply due to competing priorities, and PropTech adoption is often a lower priority than other business activities

What are your predictions for Commercial Real Estate in 2023 and beyond?

Considering the current economic climate, the Real Estate sector is facing many headwinds. From tight-

ening monetary policies, high rates of inflation, and a global energy crisis, compounded by investor and occupier pressure to decarbonize, the sector as a whole is transitioning from growth opportunities to operational efficiencies.

PropTech will also not be immune to the larger tech market correction, and is in fact more susceptible to economic shocks because it's such a young, fragile sector. The impact will likely transpire through increased M&A and consolidation, which serves to benefit end-users of these tech solutions as there are simply too many disparate solutions competing for still relatively small market share.

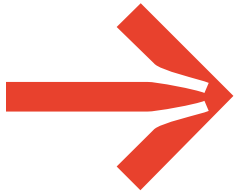
Conversely, early stage funding remains strong as the next wave of innovation is emerging in the marketplace led by the ConTech and Climate-Tech sectors. I remain, however, bullish about the future of the Real Estate tech sector. As a result of the tailwinds facing the Real Estate industry, the demand for technology will likely remain buoyant to help solve the myriad of challenges facing the sector.

The slowdown in venture funding in Commercial Real Estate tech we are experiencing today can therefore be viewed as a natural and healthy market pricing adjustment, but is unlikely to cause adverse impacts on the long-term prospects for this global ecosystem.

Some of the key Real Estate tech categories we at CREtech predict to make waves in the coming year include: ClimateTech, Construction Tech, Property Management Tech, RenTech, FinTech, OpCo/PropCo structures, Data Analytics, and Flex Space, Spatial Analytics and Tenant Experience.

HOW TO CREATE AN EFFICIENT SPACE





CONTENTS

Getting the measure of efficient spaces 42

What is the cost of Commercial Real Estate? 45

How can we improve space optimization? 46

How does occupancy monitoring work? 47

How does predictive maintenance work? 50

How does BMS optimization work? 52

Efficient retail spaces 54

Efficient healthcare facilities 55

What's next for building efficiency? 56

How can you make your office more efficient? 57

Turn your bloody lights off

Michael Grant, COO at Metrikus

'We need to stop running buildings without a speedometer': 60

How technology can drive building efficiency

Tommy Russo, SVP of Technology and Engineering at Akridge

Ready for the industrial metaverse? 62

Nancie Calder, Global Digital Sales & Service (D365)

Center of Excellence Executive at Avanade

Adding value to your vertical 65

James Lockyer, Director of IoT Sales for Microsoft, and

James Palmer, Head of Pre-Sales and BMS at Metrikus

The AI-powered workplace is finally here: This is what it means for efficiency in the future of work 67

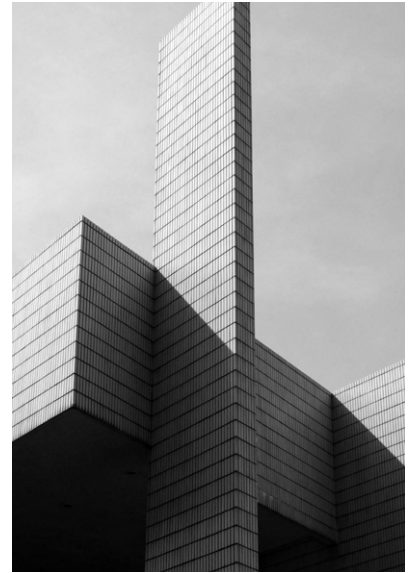
Harry Morphakis, Senior Manager at Accenture



GETTING THE MEASURE OF EFFICIENT SPACES



Buildings are notoriously inefficient and expensive to run – they're responsible for a massive 40% of global energy consumption and 33% of greenhouse gas emissions (World Economic Forum, 2021).



Office buildings across five UK cities are losing £60 million in wasted energy every year (Facilities Management Journal, 2020)

- Office buildings in the US spend an annual average of \$1.34 per square foot on electricity and 18 cents per square foot on natural gas (Mid-Atlantic Controls, 2022)
- Office buildings across five UK cities are losing £60 million in wasted energy every year (Facilities Management Journal, 2020)
- It's estimated that buildings across the US waste as much as \$100 billion on fossil fuel consumption annually (BlocPower, 2021)

Luckily, it's relatively easy to make spaces more efficient. In fact, buildings are considered low-hanging fruit when it comes to reducing emissions and tackling the climate crisis.

There's a huge opportunity to use technology and innovation to make the buildings in which we live and work more efficient in every way.

WHAT MAKES AN EFFICIENT SPACE?



Cost efficient

Businesses around the world could realize savings of **\$1.5 trillion** in reduced rental costs by avoiding wasted office space (Philips Lighting, 2017).



Operationally efficient

Having a robust predictive maintenance program in place can reduce break-downs by **70%**, reduce downtime by **35-45%** and reduce maintenance costs by **25-30%** (US Department of Energy, 2010).



Energy efficient

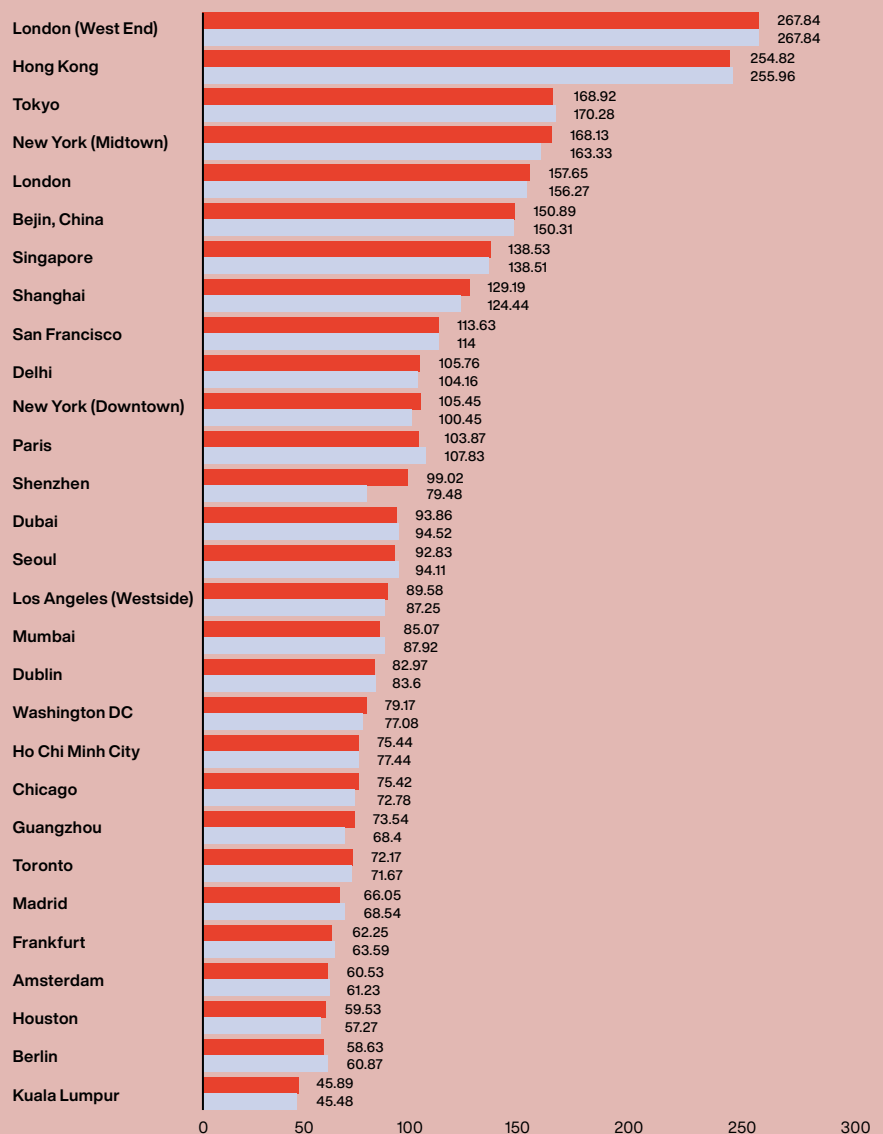
Building energy management systems can deliver energy savings of **20% to 30%** (International Energy Agency, 2021).

If you'd like to read more about energy efficiency specifically, head to our section dedicated to sustainable spaces on page: 110

WHAT IS THE COST OF COMMERCIAL REAL ESTATE?

There's no two ways about it: **Commercial Real Estate** is very expensive. When it comes to budgets, renting physical office space is usually one of the biggest financial outgoings for companies.

This graph shows the annual net effective cost for prime office space in markets around the world, in **Q4 2021** and **Q1 2022** – all in US dollars per square foot. (Statista, 2022)



Cost per square foot in U.S dollars

Q4 2021 Q4 2022

HOW CAN WE IMPROVE SPACE OPTIMIZATION?

So, with the cost of Commercial Real Estate being so high, you can understand why building owners want to reduce this space where possible, especially if a large portion of it isn't even being used.

Getting real-time data about space utilization is the first step in running a building as effectively and efficiently as possible. This involves installing sensors to monitor different data points – such as occupancy – to gain a comprehensive view of how often and when different areas are being used.

Once this data is collected and continues to be monitored, it can be used to inform decisions about downsizing, reallocating space, or creating a more effective hybrid work strategy.



HOW DOES OCCUPANCY MONITORING WORK?

Occupancy monitoring is basically just using smart sensors to gather data about how your space is being used.

There are loads of different sensors that are used, some of which are much more accurate than others. The type and number of sensors installed is completely dependent on the specific needs of the company.

Common types:

- Desk sensors
- Meeting room presence sensors
- Meeting room counting sensors
- People counting sensors

Main detection technologies:

- Passive infrared (PIR)
- Ultrasonic (US)
- Image recognition

A common concern with occupancy monitoring is that it might infringe on occupancy privacy. But in reality, the majority of sensors don't actually capture

any identifiable information about occupants. For example, an occupancy sensor would count 'one person is at desk X', rather than 'Joe Bloggs is at desk 12'.

As with all things, it's just important to do your research so that you end up using occupancy sensors that are completely compliant with privacy laws. It's also worth discussing not only with relevant stakeholders, but also with team members so they can understand how the systems work.



WHAT ARE THE BENEFITS OF OCCUPANCY MONITORING?

Understanding how much space is required

Workplace occupancy monitoring can show average utilization levels and highlight specific areas that are underused, allowing companies to make informed decisions about downsizing.

Helping employees to find available seats and spaces

We've all been there: wandering around trying to find a free conference room, and suddenly half your allocated time has been used up. Communicating occupancy data to employees and occupants can help reduce time wasted due to finding a suitable meeting space or desk.

Implementing a hybrid model

Desk booking systems with integrated monitors allow employees to book their seat ahead of time,



and the desk is made available if they don't end up using it. This is a great way of implementing flexible working while maintaining oversight of how much your space is actually being used.

Optimizing office layouts

Analysis can be done to see if the space is configured in a way which actually suits occupant needs. For example, if a large boardroom is consistently being used for two-

or three-person meetings, it could be worth rearranging the layout to include fewer large meeting spaces, and having more smaller areas for private conversation.

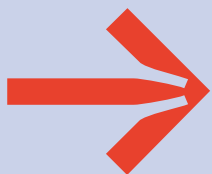
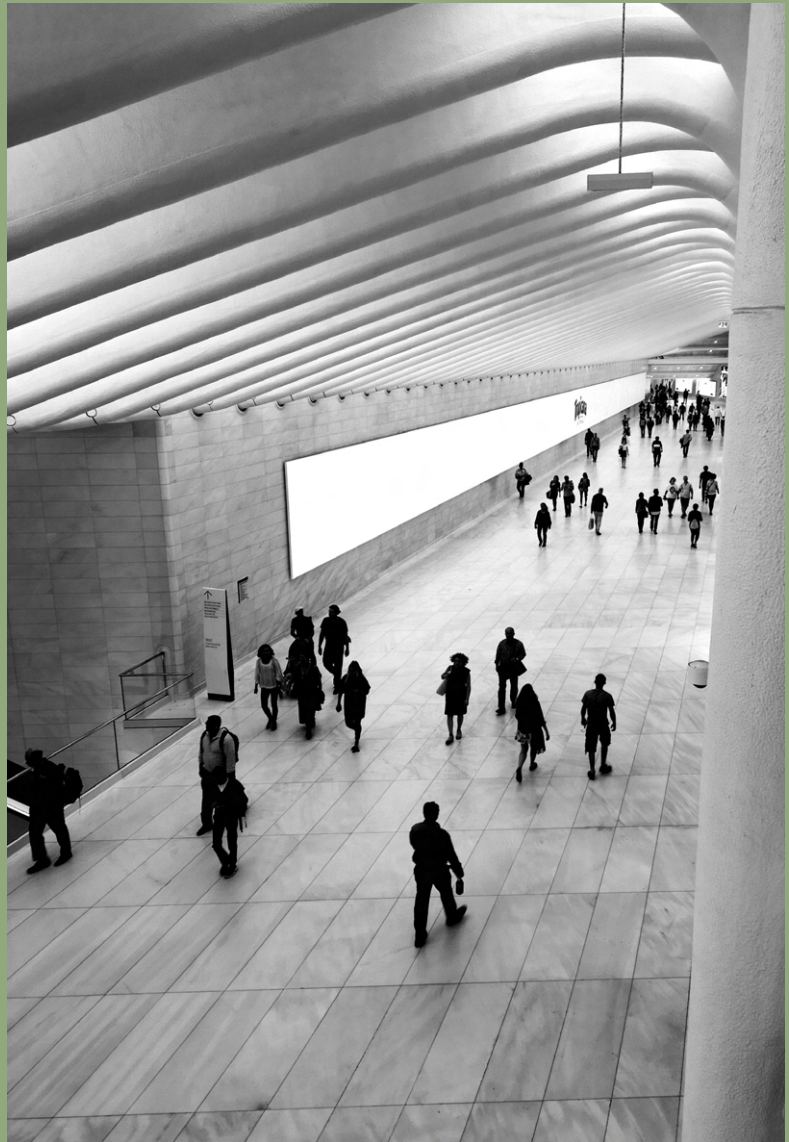
Case study

Occupancy monitoring in action


Metrikus worked with a major UK bank to optimize the utilization of their workplace. Based on manual headcounts and an estimated 71% floor peak occupancy, the bank was being asked by HR and FM to contract a new lease worth £500,000 to accommodate the expanding floating population of employees.

The Metrikus solution was deployed within a week and real-time occupancy monitoring immediately gave an accurate and detailed insight into utilization within their space.

Average utilization during the first 10 days of monitoring was only 33%. And even after stress loading with additional employees, average utilization remained below 44%. We continued to control the volume of staff on the floor, with real-time alerts to ensure any increases would not breach building regulations.



Following the monitoring period, we recommended that occupancy levels stayed between **80-90%**, enabling a **34%** increase in staff allocation. With an investment of **£5,856** and **£573,750** saved, we delivered an ROI of **>98X**.



HOW DOES PREDICTIVE MAINTENANCE WORK?

Predictive maintenance is a very effective type of condition-based maintenance that uses sensors to monitor the condition of assets and predict when they will require maintenance.

With time-based maintenance, organizations run the risk of performing too much or not enough maintenance. And when it comes to reactive maintenance, maintenance is performed when needed, but at the cost of unscheduled downtime.

Predictive maintenance solves these issues, as maintenance is only scheduled when specific conditions are met, and this prevents equipment failure – an absolute win-win for everyone involved when it comes to saving both time and money.

- **Reduce equipment downtime**
- **Increase overall equipment effectiveness (OEE)**
- **Increase first-time fix rates (FTFR)**
- **Optimize equipment lifespan**
- **Ensure compliance with building regulations**
- **Create a reputable brand image**
- **Increase employee and customer satisfaction**
- **Optimize wellbeing and safety**



The process

1. Establish baselines

The maintenance team establishes acceptable condition limits for assets.

2. Install IoT sensors

The relevant sensor is installed to the relevant asset.

3. Connect devices to software

The sensors are connected to a software platform where data is collected and analyzed.

4. Schedule maintenance

Inspections are automatically triggered when the condition limits are exceeded.

Key types

Vibration analysis

This is the go-to type of analysis for predictive maintenance in manufacturing plants with high-rotating machinery – it can detect looseness, imbalance, misalignment, and bearing wear.

Acoustic analysis – sonic

Acoustic analysis is used for low- and high-rotating machinery – it's particularly popular with lubrication technicians.

Acoustic analysis – ultrasonic

Because it can identify sounds related to machine friction and stress in the ultrasonic range, it's used for electrical equipment that emit subtler sounds as well as mechanical equipment.

Infrared analysis

Infrared analysis is suitable for lots of different types of assets, especially when temperature is a good indicator of potential issues. It's often used to identify problems related to cooling, air flow, and motor stress.

HOW DOES BMS OPTIMIZATION WORK?

First things first: BMS stands for Building Management System. It's a centralized control system that allows the control and monitoring of equipment such as ventilation, lighting and security systems. The main aim of a BMS is to improve the comfort, functionality and efficiency of any building.



What is a BMS used for?

Data collection

Collecting data is the first step in running a business, but understanding and making the most of your data is where you'll really reap rewards. A BMS helps companies to collect accurate building data, helping them to make more informed, data-driven decisions as well as ensuring compliance with industry-specific standards.

Scalability and efficiency

Having a BMS in place improves efficiency for everyone in an organization – it means that you're

able to keep on top of the needs of your company, no matter how big it gets. A well-managed BMS will make it easier for your business to automate time-consuming manual tasks and make your whole operation more scalable as you grow.

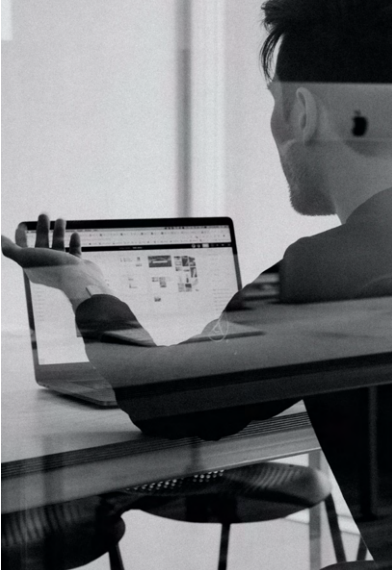
Employee satisfaction

Using a BMS can help keep everything in a building running smoothly, minimizing disruption for employees. It can also help to ensure optimal indoor air quality which is vital for employee comfort, wellbeing and cognitive function. And everyone knows that happy employees are productive employees!

Cost saving

Having a BMS will provide cost saving benefits across different aspects of your business. A centralized system allows you to keep an eye on all of your assets, minimizing any budget wasted on unnecessary labor costs and energy.





How does BMS optimization work?

By connecting a BMS to a smart building platform, data is made more accessible. Accurate information can be accessed by anyone who needs it – from the facilities management team, to the building owner, all the way to the occupiers.

Data can also be compared and analyzed across an entire portfolio, be that a small office, hundreds of rooms across numerous floors or various buildings spread around the country – even across the world.

It's possible to compare data from an entire year (or more), viewing long-term trends, peaks, and seasonality changes. Using this information, decisions can be made to optimize your BMS based on how the building has operated historically.

BMS and hybrid working

Buildings have traditionally been controlled assuming maximum occupancy and a fixed set of calendars and timers. For example, HVAC systems are set to maximum provision throughout an entire office from 8am to 6pm. With the rise of flexible working, there's a need for companies to optimize BMS systems to avoid wasted energy.

If we know that offices aren't fully occupied at all times, it's pointless for ventilation fans to be running at 100% all week. And the same goes for lighting – you only need to look out of the window to see unoccupied buildings lit up unnecessarily.

Once a BMS is connected to a smart building platform, schedules can be automated to ensure energy is only used when spaces are occupied. Less money, less emissions – it's a win-win really.



London at night.
United Kingdom



EFFICIENT RETAIL SPACES

Remote warehouse management

Sensors can be installed throughout warehouses to collect and transmit data on inventory levels, making sure that warehouses always have sufficient stock to meet any changes in customer demand. These sensors can also report on the location and motion of goods to prevent theft or tampering, and on parameters like temperature and pressure to keep goods in prime condition.

Store occupancy monitoring

Having access to accurate footfall data helps retailers to understand the busiest hours in the day, peak times of the year and average dwell times. They can then make valuable decisions about optimal opening and closing times and the right number of staff needed to manage and maintain stores.

Customer flow and demographics

On a more detailed level, sensors can show retailers which specific areas of their space are occupied or vacant, providing a wide range of insights. Patterns that emerge over time can be used to identify high interest products, optimize store layouts and avoid bottlenecks – all improving customer experience.

EFFICIENT HEALTHCARE FACILITIES



Fridge and freezer monitoring

With real-time temperature monitoring in fridges and freezers, you can set thresholds and set up alerts to make sure an optimal temperature is maintained all the time. This increases medicine safety and improves energy efficiency by preventing over-cooling. Pretty cool stuff if you ask us (pardon the pun).

Legionella monitoring

Temperature measurement is key when it comes to reducing Legionella risks, but manual testing only provides a snapshot in time and is prone to human error. With sensors in place to monitor water temperature in real time, staff can receive automatic alerts for any outlets that are non-compliant to make sure any issues are sorted out immediately. It's also a great way to ensure traceability

and auditability, as you can access historic data at any time.

Smart cleaning

Sensors can be installed to track cleaning frequencies and alert the appropriate team when a space is unclean. It's easy to identify areas that are used most frequently and at what specific times, creating a much smarter and more effective cleaning regime.

Occupancy monitoring

Hospitals can quickly become overcrowded with patients. By displaying real-time occupancy data, an IoT platform allows staff to understand and control how a healthcare facility is being used. It's easy to see how many people are on each floor or in certain areas, and even which specific beds are occupied or vacant. This can be used to direct patients to underutilized floors or empty beds quickly and efficiently.

Access control

Understanding how doors are being used is essential for building security and regulatory compliance. By installing sensors on all of the doors in a healthcare facility, it's possible to understand how many times specific doors are open or closed, and receive alerts when fire doors are left open.

Resource tracing

Sensors can be used to track the location and status of critical resources like ventilators, defibrillators, and ICU beds, ensuring staff have all the information they need to understand current capacity. Hospitals can set thresholds and receive alerts if there are any equipment faults, and this means that engineers can be dispatched quickly with the information they need to fix any equipment on the first visit.

WHAT'S NEXT FOR BUILDING EFFICIENCY?

As the global population continues to rise, cities around the world are booming which means more and more buildings are going up. It's estimated that the world will add 2 trillion square feet of buildings by 2060 – the equivalent of putting up another New York City every month for the next 40 years (GatesNotes, 2019).

It's absolutely vital that we focus on making these buildings efficient from the outset, as well as retrofitting existing buildings to make them more cost efficient, operationally efficient and energy efficient.

As we've already mentioned, improving building efficiency isn't actually as difficult or expensive as you might think. Once companies start to collect accurate data, it's easy to make small changes that make a massive impact to their bottom line.

In the coming years, PropTech solutions will continue to transform Real Estate for the better, making the spaces around us more efficient in every way.



HOW CAN YOU MAKE YOUR OFFICE MORE EFFICIENT?

TURN YOUR BLOODY LIGHTS OFF

Michael Grant, COO at Metrikus



Michael Grant is the co-founder and COO at Metrikus. Michael is an operations, strategy and management professional with over 20 years in the technology sector. Specializing in technology, software, IoT, ESG and cloud, Michael has over 10 years' experience working at Senior Management and C-Level and has dealt with large teams to deliver solutions with exceptional service – clients include those from banking, Commercial Real Estate and IT sectors.

Every single time I'm in central London – which is often five times a week – I notice lights left on at night across office floors that are completely empty. And I'd put money on the fact that HVAC systems in these unoccupied spaces are likely still running too, wasting even more energy.

The UN's environment agency recently warned that there's "no credible pathway to 1.5°C in place". It's pretty scary stuff – the world is heading for a catastrophe unless we start actually doing something to reduce building emissions.

Some companies are clearly all talk no action when it comes to sustainability, but it's not just the climate crisis at stake – the financial cost of leaving lights on is massive too. Companies could be saving huge sums of money by doing one simple thing: turning their lights off.

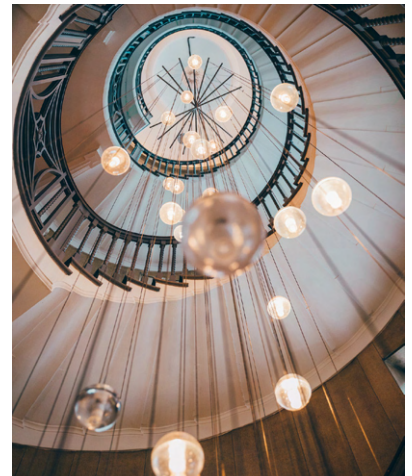
I wonder if the same people leaving the lights on in the office are also leaving the lights on at home when they head into work? Or are they remembering to turn them off to look after their own money...

Small changes to improve efficiency

When it comes to reducing energy consumption, small changes can make a big difference. Here are a couple of very easy things companies can do to avoid wasted energy.

1. Stick up posters that encourage people to check if they're the last person on the floor/in the office and to turn the lights off. If you think the cleaners might be coming, they can always just flick the switch back on again

2. Keep lights switched off in places like stock rooms and toilets when they're not in use
3. Instate 'out-of-hours' floors/spaces so lighting (and heating/cooling) is contained during low occupancy times
4. Set goals, communicate with your team, and remind people that turning lights off is everyone's responsibility. You could even set up competitions between areas or floors to encourage team involvement



'Smart' changes to improve efficiency

On top of this, there are some 'smart' changes that are quick to implement and will quickly provide companies a great return on investment.

- Install occupancy sensors that show how many people are in a space so you can quickly check if an area is empty and lights can go off
- Use a smart building platform (Metrikus is a great choice) to access historic data to see occupancy trends: maybe your office is always quiet on a Monday, so you could close a few floors to conserve energy
- Install timer sensors in areas like stock rooms and toilets

Turn your bloody lights off

If I could have just one message for companies around the world, it'd be turn your bloody lights off.

I know I probably sound like a broken record, but I just can't understand why this is still happening, especially as we contend with the climate crisis, energy crisis, and cost of living crisis. I know there are challenges to this, and in some cases there's a good deal of work to be done to actually get those bloody lights turned off regularly in a way that works with the movements of the company, but I've yet to hear of a challenge that's insurmountable.

As beautiful as the London skyline at night might be, one day I'd love to be wandering over London Bridge at midnight and see the City in darkness.

The Shard, London, UK
Photographer: Andrea de Santis

A close-up photograph of a glowing incandescent light bulb against a black background. The bulb is oriented vertically, with its base at the bottom. The glass of the bulb is clear, and the filament is visible, glowing with a warm orange-yellow light. The text of a quote is superimposed on the upper half of the bulb's glass.

**"As beautiful as the London
skyline at night might
be, one day I'd love to be
wandering over London
Bridge at midnight and
see the **City in darkness.**"**



"WE NEED TO STOP RUNNING BUILDINGS WITHOUT A SPEEDOMETER"

HOW TECHNOLOGY CAN DRIVE BUILDING EFFICIENCY

Tommy Russo, SVP of Technology and Engineering at Akridge

AKRIDGE

Tommy Russo is a nationally recognized leader in technology advancement, innovation, cybersecurity and the Internet of Things (IoT). Under Tommy's supervision, the Akridge technology team works closely with development, property management, and building engineering to provide state-of-the-art knowledge and expertise to ensure the most efficient and cost effective support and enhancement of all building systems.

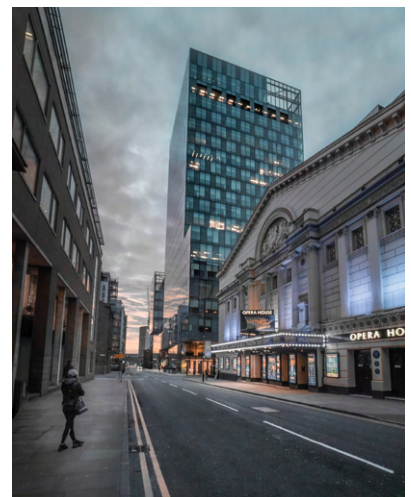
Can you imagine driving a car down the road without a speedometer? You'd get pulled over by the police and you'd get a ticket. The vast majority of buildings out there are basically running without a speedometer – key stakeholders have absolutely no clue how much energy is being used on a day-to-day basis, they're just waiting to be hit with the bill at the end of the month.

Monitoring all utilities – gas, electricity and water – in real time is such lowhanging fruit. It's so easy and it's so economical, you can immediately understand if energy is being used unnecessarily and take steps to reduce costs.

Another easy way to drive efficiency is to implement predictive maintenance – what's the point in just waiting for something to break? Being more proactive about maintenance makes end user experience so much better for everyone involved. You need to start with accurate data about all the equipment in your building and monitor performance, until you have historical data, trends start forming and you can predict failures.

It's all about using data to inform decision making. In a lot of buildings, air filters are changed every six months. This might have been okay back when MERV 10 filters were really inexpensive, but now you've got MERV 13 or 15 filters, it's a much bigger cost. We need to start monitoring the equipment and finding out when the chains go through. There's no point just blindly waiting six months – it could be three months, it could be nine – we just need to monitor the system and the airflow to make an informed decision about the changing filter.

When you consider how beneficial solutions like energy monitoring



Spinningfields, Manchester, UK
Photographer: Tom Sassi



The Oculus, New York City, US
Photographer: Felipe Barranco

and predictive maintenance are, it's hard to see why more people aren't adopting this technology. I think one of the biggest challenges surrounding this is passthrough. Building owners don't want to pay for the technology as they don't want their common area maintenance (CAM) costs to be too high and they realize it's their clients who are going to benefit. Let's say an owner spends money on an energy monitoring system – it's the client that's going to end up saving money on their bills at the end of the day.

However, things are definitely changing. In recent years, energy has been so inexpensive in the US that

there hasn't been an urgent need to reduce consumption. Now energy rates are rising, in some cases up 50%, people are frantically working out how to lower their costs. It's a whole new game – clients are actively seeking energy efficient buildings so there's more pressure on building owners to provide sustainable spaces.

There's also the impact of regulations – in Washington DC we have a thing called Building Energy Performance Standards (BEPS). Every building is rated and if you don't score well, you can be fined up to millions of dollars, so owners are realizing they need to improve efficiency in their buildings or risk being hit with a fine.

Another big change is that we've become much better at predicting cost savings. Before, there were a lot of rough figures and guesswork – now we can actually predict what a VFD or an LED change out is going to save. This makes a big difference, as you can actually go to an owner and say, look, this VFD is going to take four months to pay back but by month five, you're going to start saving money, and so will the clients in the building. It's a real ROI, and for far too long, it's been close to real, but not actually real.

It's time to stop running buildings without a speedometer, and start using data and technology to drive building efficiency – by doing so, we can save money, improve user experience, and protect the planet.



READY FOR THE INDUSTRIAL METAVERSE?

HOW REAL-TIME DATA IS PROGRESSING PREDICTIVE MAINTENANCE AND SOOTHING FIRST-TIME FIX PROBLEMS

*Nancie Calder, Global Digital Sales & Service (D365)
Center of Excellence Executive at Avanade*



Real-time data advances field service operations by allowing service providers to step deeper into optimization. While historical data triumphs in trend mapping, real-time data affords an ability to predict and respond to mechanical and system failures – by providing exactly the right support, at exactly the right time.

Nancie Calder talks us through technological evolutions in field service operations and how they're transforming the way we maintain buildings.

The biggest challenge that field service management faces is the war on talent

This is presented by the silver tsunami – the growing exit of highly skilled personnel across the labor force as they retire. If you want to attract younger, digitally cognizant generations, you need to have the latest technology in place. Our customers want to attract the brightest engineering graduates, but this workforce wants to feel like they're part of a higher-level organ-

ization with leading technology. Right now, there's a trend towards providing a hyper-convenient white-glove service that brings extra value for customers and ensures outcome-based service levels. And this is where we hit a sweet spot – by getting an asset to actually talk to the organization that's servicing it, you ensure its optimal performance.

To start with the basics, monitoring assets in real-time optimizes site visits and saves money

White vans are prevalent on roads, and we can help the technicians inside them make far fewer trips per job. One trip replaces many as IoT informs service centers about exactly what needs fixing, what part is needed, and where to find the part locally – all before an engineer is dispatched.

By reducing unnecessary and expensive truck rolls, we create savings for both the customer and the organization. And as being sustainable is so vital to companies today, reducing truck roll not only improves operational efficiency and customer

"White vans are prevalent on roads, and we can help the technicians inside them make far fewer trips per job. One trip replaces many as IoT informs service centers about exactly what needs fixing, what part is needed, and where to find the part locally – all before an engineer is dispatched."

satisfaction but also reduces carbon footprint – a huge additional benefit. The enhanced communication that this technology brings also improves maintenance success rates and helps to direct talent across a service center's workstream more effectively.

Real-time data is simply the next step in predictive field service

Organizations are fixated on achieving their first-time fix rate but too often don't yield the right result. It's all too common to send the wrong person to do the job without a full understanding of the issue at hand.

If you don't have machines remotely monitored then you're relying on a person to notice that there's a problem. While you may catch problems during routine preventative maintenance, real-time monitoring is the next level up, as it reveals the unforeseen – before it becomes a bigger, more expensive problem. Accurately monitored machinery informs of problems that could escalate, while machinery that's well-serviced always lasts longer.

The importance of personalization

I often say to customers, 'Imagine you had a car that was streaming all of its data to the cloud and showed you how your engine was running, with your usage, your speed – truly personalized to how you use your car'. The dealership would then know everything that's going on with your car and could automate its smooth running.

This type of value offering brings better customer satisfaction and the dealer could create white-glove experiences for customers – perhaps by servicing the car on-demand at your home or business. This

moves service-providing beyond its traditional prescribed timeline to a more precise, seamless, and efficient process for everyone.

If we leverage cloud technology for building operations, we would know that a particular building has been experiencing more sunlight and doesn't turn its HVAC and boilers on as frequently, so we can optimize its maintenance operations and delay a visit until it's truly needed. In the meantime, service resources could be directed to more pressing problems.

Apart from an uptick in truck roll efficiency, optimizing maintenance visits contribute to a range of benefits. The technology that we've created uses rules and alerts to remotely direct technicians to a malfunction in a complicated building layout – this is called Situational Awareness.

We have a function that works with headsets and brings incredible levels of collaboration in the realm of mixed reality. Two separately located technicians can see the same thing and annotate or draw in 3D and real-time. You can walk through standard operating procedures with schematics, or a video, and you can use 3D object overlays. Connecting with Metrikus has enabled us to deliver higher-level capabilities and enable an industrial metaverse.

IoT can be a daunting prospect for people

I often say to clients that we can start this journey from anywhere: if they're using clipboards, there are many things we can do in the short term that will help them build towards these bigger, broader plans to reduce truck rolls and improve sustainability and talent. We can start

"I often say to customers, 'Imagine you had a car that was streaming all of its data to the cloud and showed you how your engine was running, with your usage, your speed – truly personalized to how you use your car'. The dealership would then know everything that's going on with your car and could automate its smooth running."

with core IoT functionality and begin to get data that actions field service operations and start to gain insights.

At the highest end of the spectrum, you can use mixed reality. However, my first move would be to do away with pens and paper and make sure your technicians have digital tools that keep and attract them and then look at IoT – because as a technician you don't want to arrive, and be surprised, and have to deal with an irate client. Equipping technicians with a mobile tool they can use to see and diagnose problems would be a really good starting point.

We're moving toward a future where factories and facilities could have robots being run through 3D scenarios remotely by technicians, saving the need to drive there themselves and also perform hazardous tasks. That's 'way out there' but automotive manufacturers are starting to conceptualize this already.



FIVE KEY TAKEAWAYS FROM JAMES PALMER

James Palmer, Head of Pre-Sales and BMS at Metrikus



1. The biggest issue in maintenance these days is planned preventative maintenance. This was originally designed to prevent issues but has proved to often be a false economy as engineers do maintenance tasks regardless of equipment use. IoT and cloud services allow us to move to 'condition-based maintenance.'

2. Field service is more cost-effective and ensures that you're always fixing the things most in need. The only other alternative is to service machines and equipment constantly and that's simply too expensive.

3. Some things are too overwhelming for a human to see. Technology can optimize beyond our capacity, meaning that more jobs get done.

4. A cloud service can relentlessly track and monitor all data points, noting deviations from the norm and giving huge insight to engineering teams before they visit a site. The engineering team knows that the 3rd-floor AC unit needs a new filter, or that there's a potential water leak in the

basement. This results in a single-visit fix for these problems with the right person dispatched with the right tools and spares, and with the right amount of time assigned to the job. There's no diagnostic visit followed by a long wait for spares to arrive, then scheduling a fix visit at a much later date.

5. A building that trains, controls, and teaches itself will know when to heat and cool itself, when parts of its own system are about to fail, and it will be able to tell humans when to intervene. This is the future of truly smart buildings and we're getting closer to that every day.

"A building that trains, controls, and teaches itself will know when to heat and cool itself, when parts of its own system are about to fail, and it will be able to tell humans when to intervene. This is the future of truly smart buildings and we're getting closer to that every day."





ADDING VALUE TO YOUR VERTICAL

FROM FINANCIAL SERVICES TO MANUFACTURING, IOT REVEALS VAST BUILDING INEFFICIENCIES WHILE POWERING BETTER EXPERIENCES.

James Lockyer, Director of IoT Sales for Microsoft and James Palmer, Head of Pre-Sales and BMS at Metrikus



*IoT sensors are used to improve operational efficiency in buildings by connecting to a building management system (BMS) and pulling data to accurately inform stakeholders about a building's use and energy consumption. **James Lockyer, Director of IoT Sales at Microsoft (in blue), and James Palmer, Head of Pre-Sales and BMS at Metrikus (in green),** tell us exactly what you can save.*

Buildings account for 32% of final total global energy use, making up 19% of energy-related greenhouse gas (GHG) emissions and approximately one-third of black carbon emissions (Coal Energy Systems, Bruce G. Miller, 2005). Reducing emissions in buildings is critical for a low-carbon future.

It's true that there are some striking statistics: 25% of the total operating costs of offices are spent on energy and water, while 25-30% of water consumed in buildings is wasted. We've designed solutions with our partners which enable us to reduce those figures significantly – which

obviously has huge environmental gains as well.

When you consider a building's HVAC system heating and cooling a building, the same rules apply in terms of being able to monitor and optimize those HVAC systems for energy efficiency, whether it's a manufacturing plant or a commercial office building.

Typically we see anywhere between a 15-30% reduction in a building's energy usage through the deployment of energy management solutions. And that has a brilliant knock-on effect because it's actually helping organizations to reduce their energy costs as a result.

Financial services are our biggest smart buildings vertical and these organizations tend to own most of their Real Estate, but we've seen wins across every industry that invests in smart buildings. Property owners and operators are looking at cost savings, operational efficiencies, and their net new revenue. And then you've got the tenants and occupants and the differentiated workspace element.

"Typically we see anywhere between a 15-30% reduction in a building's energy usage through the deployment of energy management solutions."

A well-managed workspace with a really cool occupant experience is a huge plus for organizations looking to hire and retain talent.

It was genuinely difficult to convince financial institutions to invest in PropTech before energy prices rose. They could get much better returns by re-investing their own money in the various markets they built their core business on. These days, the scale of the returns on offer, allied with the need to report on ESG, means that this argument is a lot easier to make. Some of our biggest recent successes have been in the financial sector – you could say they saw the ROI potential immediately.



"It was genuinely difficult to convince financial institutions to invest in PropTech before energy prices rose. They could get much better returns by re-investing their own money in the various markets they built their core business on."

*James Palmer,
Head of Pre-Sales and
BMS at Metrikus*

Manufacturing primarily operates in large, open spaces, which simplifies installations. Wiring runs become a cinch and radio signals get line-of-sight signal strength. We don't have to worry so much about the aesthetics of sensors on walls – and the wins are often easier to spot. When correctly deployed and analyzed, IoT can save you a lot of money.

We have seen some incredible energy-reduction outcomes from the engagements that we've had, and the payback on these projects is impressive. We have seen consistently that projects are paying for themselves, with payback varying anywhere between 6-12 months. This is translating into annual cost savings and reduction in energy usage which we are seeing reported as gigawatt-hour (GWh) reductions in our customer's sustainability annual reports. Meeting many different goals for customers across energy, occupant experience, and facilities management makes the argument for IoT-driven smart buildings pretty pervasive. The digital twin of a building is something that we see more interest

in. By modeling the physical world in a digital environment, you can simulate changes and see what impact they have on building operations and then implement the successes. Machine learning helps optimize energy use and building health using fault rules, predictive maintenance, and command or control – these are all underpinned by AI.

And now we can start to look at how to optimize energy use for grid services. And I think that gets really interesting because then we enter a world of grid-interactive buildings which I think is a really cool topic. You could have rooftop solar connected to EV charging points or external lighting, or use the energy to further decarbonize building operations. If anything, I think the opportunity is to drive more awareness around what is possible, particularly when you consider both the energy crisis and climate crisis.

"We have seen consistently that projects are paying for themselves, with payback varying anywhere between 6-12 months. This is translating into annual cost savings and reduction in energy usage which we are seeing reported as gigawatt-hour (GWh) reductions in our customer's sustainability annual reports."

*James Lockyer,
Director at IoT Sales for Microsoft*



THE AI-POWERED WORKPLACE IS FINALLY HERE: THIS IS WHAT IT MEANS FOR EFFICIENCY IN THE FUTURE OF WORK

Harry Morphakis, Senior Manager at Accenture



We'll gain more than a better workplace experience from machine-learning developments, explains Harry Morphakis. Causal AI delivers critical insights that promise even smarter, more efficient buildings.

The long-heralded arrival of AI-powered workplaces has been greatly overexaggerated due to a variety of factors related but not limited to:

1. A deep misunderstanding of what artificial intelligence actually is (spoiler alert: it's more than a simple 'if this, then that' rule)
2. Related to the above, every startup uses AI as a catch-all term for either a capability that doesn't exist (how often do we hear "the AI will do it"?), or for something they don't understand
3. We haven't yet crossed the inflection point where the marginal cost of energy needed to facilitate AI computing drops to near zero to enable us to build, train and test the deeply complex AI models required to make a generational leap in workplace experience

Finally, after many years of cyclical hype and disappointment, we believe the very first AI-powered workplaces will be built within the next couple of years and are beyond excited for what this means, and the potential it will unleash for the future of work.

An important reminder: this article isn't intended to detract from the excellent work of a wide-range of vendors and system integrators who specialize in smart building technologies. Genuinely useful and powerful automations using IFTTT rules have been created; instead we are looking to highlight that this is just the starting point for the future of the workplace. Where we go from here is the exciting part.

When we refer to the 'workplace', we no longer only mean the 'corporate campus' – this term now encapsulates wherever work is being completed from: remote location, the home, or the local coffee shop. AI has the potential to genuinely reshape our experience of work and the workplace. IFTTT refers to 'if this, then that' programming automation rules that connect apps and services.

"We believe the very first AI-powered workplaces will be built within the next couple of years and are beyond excited for what this means, and the potential it will unleash for the future of work."

Simply put, triggers are defined (if this), and then actions decided based upon that trigger (then that).

A basic, yet powerful example of this could be when CO₂ in a room exceeds 1000 ppm, a notification is triggered to the user to open the door and ventilate the room. The advancement in IoT systems, network infrastructure and API development has enabled us to reach these heights today, but this is just the beginning. Imagine setting triggers for room temperature that signal to the building to cool or heat itself as required, giving buildings the ability to almost think for themselves.

So, what really is AI?

We have all been to websites that recommend products to buy and articles to read that have been selected 'just for you.' These correlations are nothing more than simple rule-based algorithms. A deep dive into rules-based logic is beyond the scope of this article, but put simply, the system logic is deeply inflexible and requires manual configuration. Smart, automated workplaces can most certainly be developed using this model, however, over time they become expensive to enhance and require significant effort to build and test on an ongoing basis.

This brings us to the core of the discussion: we believe that machine-learning algorithms are key to evolving the future of the workplace. In this instance the algorithms aren't developed by humans, they are created through selection of an AI model trained on vast data sets. The human input here, whilst seemingly less tangible, is even more critical. It is up to humans to guide the AI, setting out the principles and parameters for what we want the algorithm to optimize for. Machine learning algorithms are best guided by principles and statistics than abstract logic statements.

What does AI mean for me?

This doesn't mean that machine-learning algorithms are easy to build, train or implement. This is a complex engineering problem that has only recently been solved through evolution in processing power requiring less energy expenditure. AI is going to unlock exciting automations and insights over the

coming years – the path forward will not always be smooth, there will be many mistakes made and so-called 'optimizations' that don't pan out.

Workplace leaders in this space need to be bold in truly understanding the data, the AI models, and actual causality. Put simply, causal reasoning is a more accurate predictive modeling method that doesn't rely on historical pattern algorithms but identifies relationships between cause-and-effect data. This gives it the ability to source the root cause of an outcome and model varying interventions by asking 'what if' questions.

"In short, decision-makers can compare these outcomes to different, otherwise unforeseen scenarios far more effectively than ever before. It's the most powerful AI development to date, and its exceptional insights have the potential to determine the most efficient workplace solutions in vastly varying situations."

Heads of Real Estate and IT should be focused on how they re-engineer their PropTech and workplace technology stack to focus on available and open API architecture that allows ingestion of real-time data into flexible data warehousing structures. This will pave the way to data aggregation across multiple domains that over the long term will enable a 'workplace data science' capability.

When we allow for the A/B testing of different protocols, processes and technologies across teams, we'll be able to experiment and truly understand – in a data-driven way – how employee experience is impacted by the workplace.

Causal AI will unleash a quantum leap in how we interpret, test and build next-generation workplace experiences, and we can't wait!



Precise experiments. Powerful decisions.

Make workplace decisions with **confidence**, **define your new standards**, and **bring employees back faster**.

One experiment at a time.



Validate your most crucial decisions quickly to bring employees back faster

Whether you're experimenting in one building or one floor, spatial intelligence is your key to unlocking a true understanding of your spaces.



Build your new standards fueled by occupancy data from your first experiment

The foundation for broader organizational buy-in for your transformational workplace strategy starts with small, measured experiments.



Take command of your portfolio right-sizing decisions

With passive occupancy accounting for 50% of how your offices are used, a true understanding of utilization will allow you to improve employee experience with confidence.



Attract more employees by confidently creating spaces they'll want to use

Make employee experience your competitive advantage and attract top talent and stand out in the employer marketplace.

HOW TO CREATE A PRODUCTIVE SPACE





CONTENTS



Hudson Yards complex
Photographer: Jane D'Souza

Getting the measure of productive spaces	72
What is indoor air quality monitoring, how does it work, and why is it important?	75
How much CO₂ does an unused desk emit into the atmosphere? Dave Cairns, Senior Vice President – Office Leasing at CBRE Canada	79
IAQ: best practice: Simple steps to a healthier, more productive indoor environment	82
How to communicate IAQ improvements within your space	84
The key components of a productive space	85
Curating the vibe: How creating productive spaces goes beyond the physical Caleb Parker, founder at Bold	88
A tale of two twins: Joining up our thinking around people and spaces for hybrid Josh McDonald, Global Connected Workplace Lead at Avanade	90
Navigating the office of the future Tony DiBenedetto, CEO at Appspace	91
From renting spaces to being customer centric Alfredo Díaz Araque, founder at Spanish PropTech	93
Employee productivity: Data and trust work best for your business Richard Gregory, Global Head of Value Realization at Avanade	95
Designing along a spectrum of noise: Getting more out of smaller spaces Stefanie Sebald, Head of Design at Kitt	97
In the zone: How color can transform the space we work in Emma Bestley and John Stubbs, co-founders of YesColours	99
Staying focused and managing distractions, wherever you're working Laila Datoo, Workplace Wellbeing Expert, Mindfulness Trainer at A Life More Mindful	104
Effectiveness: When we broaden our view on experience, we can begin to design for productivity Corinne Murray, founder at Agate	106

Getting the measure of productive spaces



What harms our productivity?

Productivity changes from person to person, but there are some factors that enable us all to work more effectively. They include obvious quick-fixes, such as ergonomic chairs and adequate lighting, to the invisible features of our indoor environments.

Indoor air quality

The conversation around outdoor air quality has gained traction in recent decades, but the importance of indoor air quality (IAQ) is still often overlooked. The COVID-19 pandemic shone a light on the air we breathe every

day, especially with most of the population spending almost all their time indoors during various lockdowns and stay at home orders.

Indoor air quality is the type of thing that you don't notice until it's bad, and so IAQ is rarely considered as a contributing factor to productivity, but poor air quality can significantly hinder employee performance and impact even the most motivated of workers.

Noise

Excessive noise is the (not so silent) productivity killer. Ranging from being an irritating distraction to severely impacting our mental



and physical health, one thing is for certain: noise pollution in the workplace is harming employee productivity.

Constantly being surrounded by conversations, ringing phones, traffic noise and building works is damaging the concentration and productivity of 69% of employees globally (Interface, 2019). While researching the impact of sound, psychologist Nick Perham found participants' ability to carry out math tasks and recall information was severely reduced by background noise (Noise Health, 2013).

Exposure to excess noise can also cause physiological

responses that create long-term health issues. When surrounded by intermittent loud noise, our bodies experience unnecessary stress responses, such as increased heart rate, blood pressure and cortisol levels.

More and more, companies are looking at how to integrate quiet areas into their work spaces. As the return to the office remains a contentious issue, providing spaces that are as calm and quiet as people's homes is still a top priority.

Space utilization

Speaking of quiet spaces, the conversation around task-oriented spaces continues when thinking about the productivity of offices. Compound this with a recession, and it's likely that many offices won't be able to afford a move or a big renovation, meaning spaces may need to be reconfigured in cost-effective ways.

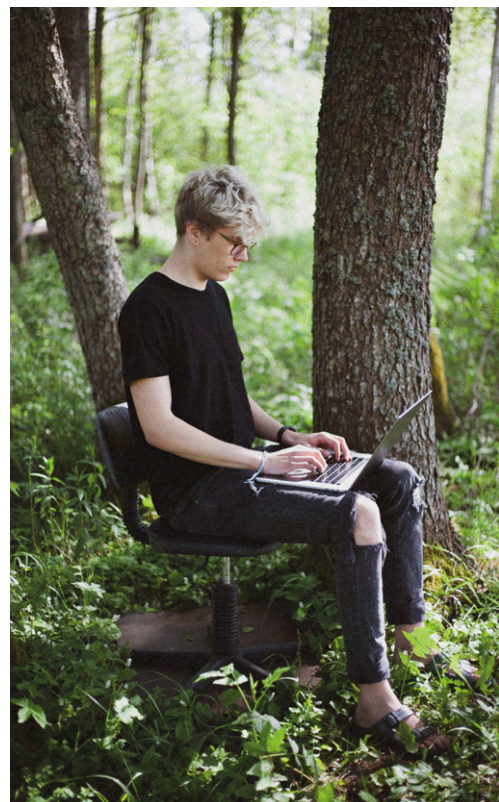
The humble meeting room is a great example here. In a pre-pandemic world, meeting rooms largely went about their business without much fuss – sometimes there might be a clash, but that was it. Post-lock-downs, meeting rooms became the hottest office Real Estate there was, a hub in a world where hybrid calls reign supreme.

Now though, they may need to change again. If a company is still trying to get people back to a busy, noisy office but can't afford to change the way the space works, meeting rooms may need to serve as a quiet working space

– the main benefit that people cite about working from home, aside from commute expenses.

Likewise, people may now split their time between the office and their homes according to their specific tasks, creating their individual methods of hybrid working. Time spent in the office is still hugely beneficial for meetings and impromptu discussions throughout the day. Alternatively, home may be a far more productive environment for deep work tasks.

In the conversation of workplace productivity, the key thing to remember is that everyone works differently, so having the freedom to create a personalized work schedule will be invaluable going forward.





Mental health and wellbeing

A 2017 survey from Deloitte suggests one in six workers experience a mental health problem at any one time.

It is crucial that businesses are open and transparent about mental health, and managers can lead by example in approaching difficult conversations with compassion and openness. Simple things like taking regular breaks and leaving the office on time where possible can also send a powerful message to employees about the importance of their wellbeing.

According to research by the University of Warwick, addressing wellbeing at work increases productivity by up to 12%. And another study found that businesses that invest in mental health interventions report an average of £4.20 return for each pound spent (GOV.UK, 2017).



What is indoor air quality monitoring, how does it work, and why is it important?

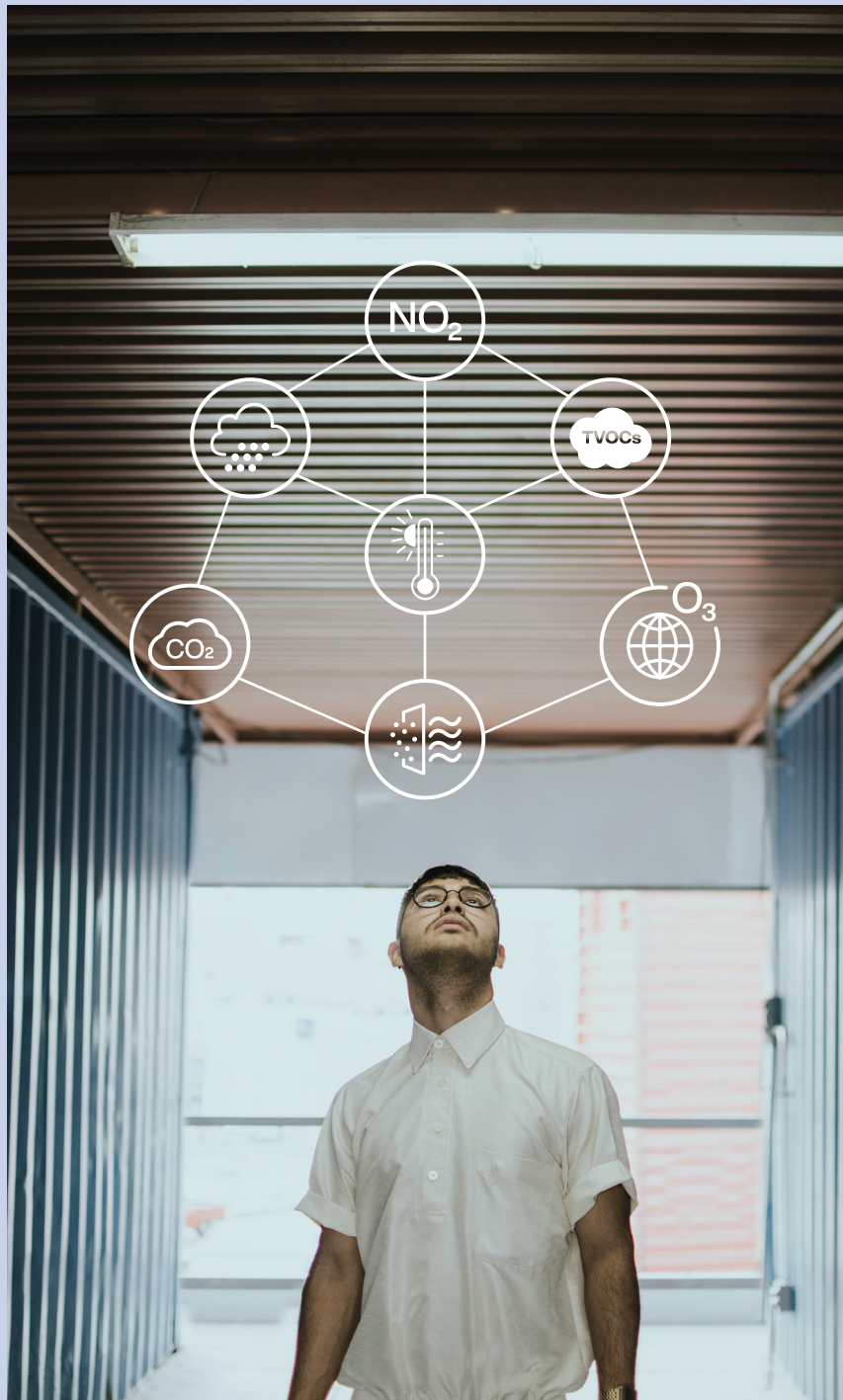
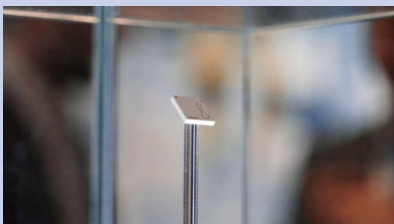
Indoor air quality (IAQ) monitoring is all about using smart sensors to assess and improve the quality of the air in your building.

Alerts can be set up to notify you when key IAQ parameters exceed optimal levels, and sensors can even be integrated with your Building Management System (BMS) so that any necessary changes are made automatically.

Which air quality parameters are monitored?

There are a number of factors that can have an impact on your indoor air quality, including:

- **Temperature**
- **Humidity**
- **Carbon dioxide (CO₂)**
- **Ozone (O₃)**
- **Nitrogen dioxide (NO₂)**
- **Total volatile organic compounds (TVOCs)**
- **Particulate matter (PM2.5)**





Temperature

Temperature being at the wrong level can seriously adversely affect workplace comfort. It may sound minor, but a 2015 CareerBuilder study found that 53% of employees are less productive when their work environment is too cold. Poor thermal comfort can also contribute to Sick Building Syndrome (SBS) symptoms, including headaches, itchy skin, dry or sore eyes, blocked or runny noses and rashes.

The problem is that everyone's optimal thermal comfort level is different, and people rarely agree about what temperature the office should be. But there's a broader issue too: a 2015 study published in the scientific journal, *Nature Climate Change*, found that the majority of office buildings use temperatures that were set with men in mind and were only revised many decades ago. It was

also found that women generally prefer an office temperature of around 24°C (75.2°F), whereas men are more comfortable at around 21°C (69.8°F).

As far as the general research goes, it has been shown that the performance of office work is maximized between 21°C and 22°C (69.8°F and 71.6°F), and that for every degree above 25°C (77°F) productivity will decline by 2%.

While it's important for temperature to remain within reasonable parameters, one option is to have areas with slightly different temperatures. If employees can see this data, they can choose a space that will be most comfortable for them.

Hot topic

Temperature monitoring was a hot topic in 2022 for two big reasons. Firstly, COVID-19 remained (and remains to this day) a problem for offices and a serious issue when discussing the return to work.

SARS CoV-2 (the virus that causes COVID-19) is more stable and therefore survives longer in lower temperatures, with some organizations recommending 71.6 to 77 degrees °F (or 22 to 25 degrees °C) for reducing the viability of the virus.

However 2022 saw another massive factor come into consideration: the global energy crisis. Many governments and organizations brought in rules to combat soaring energy prices and risk of blackouts, including setting

thresholds on temperatures. In Germany, the Energy Saving Ordinance came into force on 1st September 2022, to remain in effect until the end of February 2023 (at the time of writing). One key part of the Ordinance is that public buildings – with the exception of places like hospitals – can only be heated to 19°C (66.2°F) and halls and corridors should generally not be heated.

Meanwhile in Denmark, where a similar rule applied, major banks started handing out blankets to staff to deal with the slightly-lower-than-comfortable office temperatures, as reported by Bloomberg. While many praised the move, likening it to putting a sweater on at home, others pointed out that the situation at home is not the same as in the office.



Layer up?

Francesca Brady, CEO and co-founder at AirRated, responded to comments supporting the 'layer up' angle. Whilst agreeing that at home throwing another item of knitwear and grabbing a blanket was a great option, she also pointed out a few key considerations for translating this to the office:

- **Setting the thermostat to 19°C (66.2°F) at home is a personal/household decision and not taken out of your control. For those with choice, this decision may reduce the desire to return to the office even more.**
- **For people with Reinalds and other circulation issues, lower temperatures like these could have painful consequences.**
- **SARS coronavirus is shown to have better stability (will survive longer) in low temperature environments, which may facilitate its transmission. 22-25°C is recommended for reducing the viability of the virus. (Humidity also important to note here!)**
- **The productivity and comfort factor.**

Francesca Brady, CEO and co-founder at AirRated

The discussion around temperature alone shows that when it comes to creating a productive workspace, things are certainly not clear cut.

leading to issues with humidity. Investing in a good ventilation system and monitoring your indoor environment is a far more economical alternative to losing key team members for prolonged periods. A 2016 report from the UK's Office for National Statistics showed that workplace absenteeism through sickness cost the UK economy 137 million working days in 2016 (equating to around £18 billion).

Symptoms of Sick Building Syndrome (SBS), such as coughs and colds, were the most common reason for sickness absence. A combination of a strong, well-maintained ventilation system and monitoring workplace air quality, can optimize working conditions by preventing SBS and stemming the transmission of viruses.

Wondering how you can ensure your humidity levels don't become too high at home? Make sure you use exhaust fans in your kitchen and bathroom. If your house is particularly humid, it could be a good idea to invest in a dehumidifier. If you want to increase your humidity levels, you can simply boil water on your stove or use a humidifier.

Humidity

Temperature is only the beginning when it comes to office environment considerations. Let's talk about humidity.

Relative humidity is the concentration of water vapor present in the air, expressed as a percentage. Humidity can directly affect health and comfort, encourage the presence of biological pollutants such as mold spores, and affect the concentration of volatile organic compounds (VOCs).

Like temperature, it has an important impact on the survival rate of viruses. Humidity lower than 30% causes eyes and skin to become dry and irritated and can aggravate conditions like asthma. It also causes mucous membranes to dry out, which compromises our body's natural defense to viruses. High humidity, greater than 60%, can impact feelings of lethargy and exacerbate allergies and respiratory diseases.

In recent years, buildings have become increasingly airtight,



Carbon dioxide

Next up, carbon dioxide (CO₂).

CO₂ is a naturally occurring, colorless, odorless gas that makes up 0.04% (400ppm) of air and is measured in parts per million, or ppm. CO₂ is not harmful to health unless levels reach >4.0% of air composition (40,000ppm).

That being said, there is loads of scientific evidence that proves fresh air is necessary for optimal performance in the workplace. Employees who work in overcrowded offices or attend long meetings in poorly ventilated rooms are likely to experience high concentrations of CO₂, and this increases the risk of Sick Building Syndrome (SBS) symptoms.

The business of work

We've all been in a stuffy meeting room, pinching our legs under the table to keep ourselves alert. The problem is, when several people

work within a confined or poorly ventilated area, they can deplete the surrounding oxygen at a faster rate than it's being recovered. Meanwhile, CO₂ is produced as we breathe; during an entire working day this can create problematic levels of CO₂, which can negatively affect employee health and effectiveness.

- **Increased drowsiness, loss of concentration and impaired attention spans (UCL, 2014)**
- **23% impairment in decision-making (Environmental Health Perspectives, 2012)**
- **11% reduction in productivity (Environmental Health Perspectives, 2012)**

There's also a wealth of research on the impact of high levels of CO₂ on cognitive ability. Researchers at the Lawrence Berkeley National Laboratory said of the topic: 'There is substantial evidence that performance on challenging tests of decision-

making and challenging flight simulations is worsened by [carbon dioxide] concentrations as low as 1,000 ppm.'

There's even research that suggests that when CO₂ exceeds 1000 ppm has the same effect on cognition as two pints of beer (Satish et al., 2012)!

All is not lost, however: Harvard School of Public Health ran a double blind study that showed that well-ventilated offices with low pollution levels led to workers having double the cognitive function compared to workers in offices with average levels of the exact same pollutants. Moral of the story? Keep things ventilated and keep pollutants low.

Monitoring CO₂ allows you to track key areas in real-time, and react appropriately to reduce elevated levels (in many places, opening a window is a start, but be mindful of the outside environment).

How much CO₂ does an unused desk emit into the atmosphere?

Dave Cairns, Senior Vice President – Office Leasing at CBRE Canada

Dave Cairns is an office leasing and investment sales agent at CBRE who started his career in Real Estate after becoming a world-ranking professional online poker player. As an agent, Dave has transacted 1000+ deals totaling more than 5 million square feet. Dave is an avid content creator on LinkedIn, becoming one of the most influential voices within the commercial real industry globally, and has amassed over 10 million views since 2020.

Can you guess how much CO₂ an unused desk emits into the atmosphere on an annual basis? 1 TON!

According to the Chartered Institution of Building Services Engineers (CIBSE), each unused desk in an office equates to the creation of approximately one ton of unnecessary CO₂ every year, due to powering space that isn't used.

So let's lay out some data:

- **Size of the US Office Market:** 97 Billion Sq. Ft. (as of 2018 and estimated to grow to 126.4 Billion Sq. Ft. by 2050, Source: Google)
- **Average desk size:** 50 Sq. Ft. per person (Source: Hubble)

- **Average Desk Utilization Rate:** 60% (Source: Kadence)
- **Size of Knowledge Workforce US:** 100 Million people (As of 2021, Source: askwonder.com)

Now let's do some math:

- **100MM x 50 = 5B Sq. Ft. of (purely) desk space in the US**
- **5B Sq. Ft. x 1 Ton CO₂ = 5B Tons of CO₂**
- **5B Sq. Ft. x 0.40% (desk utilization shortfall) = 2B Tons of WASTEFUL CO₂ emissions**

This is some powerful math to consider and I'll note that it doesn't account for the fact that post-pandemic utilization rates are *much* worse, resulting in an even greater CO₂ problem that isn't going away unless companies rethink their Real Estate strategy.

Despite this, many from the CRE community turn a blind eye. Early in the pandemic many CRE leaders said we would need MORE space to accommodate for "collaboration" (a head scratcher!).

And lately, some CRE leaders have even said we need to reframe how we consider the utility of an office, moving away from occupancy metrics and towards its "greater good".

I have to question, doesn't the "greater good" equate to reducing the harmful impact of offices

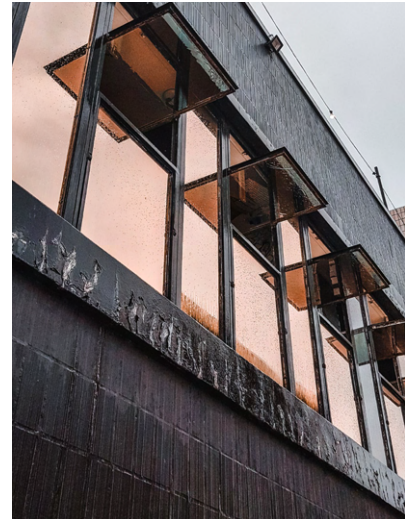


and improving the employee experience along the way?

Because when we look at how offices are (not) used, it feels to me like occupancy is pretty damn important given that our house is burning down, no?

And it feels to me like MORE companies migrating their traditionally leased footprints to flex spaces (reducing their portfolio size and catering to distributed teams) is a silver bullet just waiting in the weeds!

This was first posted by Dave Cairns on LinkedIn. Reprinted with permission.



Nitrogen dioxide

Nitrogen dioxide (NO₂) primarily gets into the air from the burning of fuel. It can form from emissions from cars, trucks and buses, power plants, and off-road equipment.

Breathing air with a high concentration of NO₂ can irritate airways in the human respiratory system. Periods of exposure can aggravate or even contribute to the development of respiratory diseases, particularly asthma, and lead to respiratory symptoms such as coughing, wheezing or difficulty breathing.

Again, having a good ventilation system which removes the need to open windows onto busy, polluted streets is a start for workplaces.

While you are at home, there are some key rules to follow to ensure your NO₂ levels don't become too high. These include keeping gas appliances properly adjusted, using the correct fuel in kerosene space heaters, and opening flues when fireplaces are in use. You should also never keep your car running inside a garage. These tips are also useful to reduce exposure to carbon monoxide.



Total Volatile Organic Compounds

Total Volatile Organic Compounds (TVOCs) is a collective term used to define a group of common VOCs. VOCs comprise a wide range of chemicals, which may be emitted over a period of weeks or years. Their main source is construction and furnishing products such as sealants, paints, wall and floor coverings.

Short-term exposure to elevated levels of VOCs causes adverse effects like eye and respiratory tract irritation, headaches, dizziness, visual disorders and memory impairment. There has also been an association between higher concentrations of VOCs in indoor air with allergies, asthma, and other respiratory health symptoms. Long-term health effects include prolonged eye, nose and throat irritation as well as liver, kidney and central nervous system damage and even cancer.

It's important to ensure indoor spaces are adequately ventilated, especially when things like cleaning products or air fresheners are used frequently.

PM2.5

PM2.5 is defined as fine particulate matter with a diameter less than 2.5 μm . Particles like these are harmful as they can penetrate into the lungs and bloodstream. Short-term exposure can cause irritation of the airways, coughing and cardiovascular problems. Most worryingly, long term exposure can cause premature death from heart disease and lung disease including cancer.

There's no safe level of PM2.5, but the guideline set by the World Health Organization (WHO) is 10 $\mu\text{g}/\text{m}^3$. For every 10 $\mu\text{g}/\text{m}^3$ increase in levels of PM2.5 above this guideline, life expectancy is seen to be lowered by one year.

Once again, we come back to proper ventilation in the workplace. In so many cities, construction is almost constant, and so opening windows is a sure-fire way to immediately increase levels of PM2.5.



An easy way to prevent high levels of PM2.5 in the home is to avoid using wood-burning stoves, or to ensure adequate ventilation when they are in use.





IAQ: best practice

Simple steps to a healthier, more productive indoor environment

Sort out your ventilation, filtration and purification

Ventilation has a hugely important role to play in managing humidity levels and ensuring that occupants have access to fresh, clean air.

- **Maintain HVAC systems**
- **Open windows where possible and only if the outdoor air is not heavily polluted – in most cities, it will be**
- **Open meeting room doors periodically**
- **Consider investing in a purification system. Keep an eye out for air purifiers with a high CADR (clean air delivery**

rate): the higher the number, the faster the unit will filter the air. You should also look out for units that comply with the UL-2998 standard, as this means they will not emit ozone

Control and monitor indoor pollution sources

When it comes to creating a healthier indoor space, it is also worth considering how you can control indoor sources of pollution.

- **VOCs are emitted by things like furniture, sealants and paints: if you're decorating your office try to opt for low VOC options**
- **Keep printers and photocopiers in a separate, well-ventilated**

room as they can produce dangerous levels of ultrafine particles (UFPs) and ozone which can be harmful to health

As we've already mentioned, installing sensors is a really effective way to understand and improve your indoor air quality.

Clean regularly and with the right products

Another simple method to optimize your indoor air quality is to have your space cleaned more regularly, as pollutants often become attached to surfaces.

- **Making sure that carpets and rugs are cleaned at least once or twice a week with a vacuum cleaner, ideally equipped with a HEPA filter, is a really easy win**
- **It's also worth bearing in mind that many regular cleaning products release VOCs into the air, so it is helpful to opt for natural and non-toxic products wherever possible**

Install occupancy sensors

Occupancy monitoring is also an extremely valuable tool for creating a healthy indoor environment. It is the best way to understand and control how your space is being used.

- **Sensors can accurately track key factors including real-time people count, density in a given area, distance between occupants and movement between zones. Alerts can then be used to manage the flow of occupants to avoid overcrowding**
- **Occupancy data can also inform cleaning schedules. Understanding the areas of a building that have been used the most, or perhaps not even used at all, can ensure that cleaning is more focused and effective**

Go above and beyond

If you'd like to go above and beyond to improve your indoor air quality, here are three great options.

Air purifying paint

If you are looking to redecorate, it is a great idea to use an air-purifying paint such as Airlite. This environmentally friendly paint can be applied on any typical surface inside or outside to eliminate 99.9% of bacteria and mold, reduce air pollution by 88.8%, and neutralize any odors. Provided in a powder form, it has to be mixed with water before application which guarantees perfect coverage and a long-lasting effect.

Indoor plants

Indoor plants have long been thought to purify the air, but a 2019 study published in Nature revealed that in order to make a substantial difference, you would actually need to fit between 10 and 1000 plants per meter squared in a room. However, they are a great addition to any space, and there are a wide range of studies showing the general health and wellbeing benefits they can bring. There are also certain plants that are thought to be particularly good for indoor air quality, including snake plants, spider plants and peace lilies.

Living plant walls and preserved moss walls

Living plant walls or preserved moss walls can transform your walls into a stimulating eco-friendly display. Not only

can they improve indoor air quality, but they're also proven to increase productivity and creativity in employees. A 2014 study published in the Journal of Experimental Psychology Applied, found that workers who had more contact with nature were 15% more productive.





How to communicate IAQ improvements within your space

So you've implemented sensors?

One way to communicate this to your team or tenants is by visualizing the data, such as a tablet on a communal table or outside different meeting rooms or spaces. This means that people can make informed decisions about how they move around the spaces they work in.

You can go one step further by publishing this data online. This means, for example, that people can decide whether or not to come in based on occupancy levels and historic trends.

So you've taken steps to improve your IAQ?

The thing with IAQ is that you only really notice it when it's bad, for example when you feel groggy in a stuffy meeting room or too chilly in the office.

Luckily, there are certifications out there that can really easily communicate your hard work and good IAQ to anyone who comes into your building or office, be they tenants, employees or guests. AirRated, WELL, BREEAM and LEED are leading the charge in this space. A plaque on your wall can really help assure occupiers that the space they're in is managed to the highest standard.

Finally: let them know!

As with many things in life, communication is key. You can use the information in this section to send out comms about the different parameters, how they affect health and wellbeing and what you've done to optimize them.



The key components of a productive space

We asked our community: what do you think makes a space truly productive? Here's what they had to say.

For me, the **beauty of the workplace** plays an important role in driving my productivity. A well-trodden criticism towards beauty is that it is subjective and, therefore, it would be impractical to use it to drive productivity.

But, in practice, beauty has objective standards – applicable to the workplace – as demonstrated by the field of neuroaesthetics. For instance, symmetry is one of the objective standards of beauty, as it is highly preferred across cultures, genders, and age groups. (If this is of interest, there are several academic studies support the link between workplace beauty and productivity, including Kaplan & Kaplan's book "The Experience of nature: A psychological perspective" and Schell & al.'s article "Workplace aesthetics: Impact of environments upon employee health?".)

Dr Alexandra Dobra-Kiel, Innovation and Strategy Director at Behave

I'm very lucky to have a great space to work from home where I have a great setup and can play music as loud as I like all day long – that's something that really helps me concentrate.

As far as an office/coworking goes – it sounds small but easy access to a kitchen and good coffee makes a huge difference. If I know the kitchen is 100m+ away (eg: a very big office space with one kitchen per floor) I'll put off getting up to get

a glass of water or a coffee – but a lot of time the five minute break while the machine's working and you're staring at the wall unfocused is **exactly what your brain needs!**

Wayne Durack, co-founder at Failsafe Engineering

A productive workplace is well located, well connected, comfortable and flexible. It offers value to both teams and individuals and it **embodies choice.**

Chris Early, Head of Acquisition at Freshwave

Variety. It's unusual to have only one type of task for the whole day, so the most effective workspaces have a variety of types of space for different types of tasks. **Collaborative. Quiet. Playful. Serious. Noisy. Reflective.** If a space only has one mode of work in mind, then it's unlikely to work for most people.

Matthew Knight, Strategy and Innovation Partner at foxlark and founder/Chief Freelance Officer at Leapers

I think the biggest challenge is **removing distraction.**

Whether we are working alone or as a small group, the most productive work seems to be done in a state of flow, when you are fully absorbed in your activity.

Like you say, I think everything has an impact, and we can't isolate a single most important element. The most

”

An open and honest culture with passionate and supportive colleagues!

Saskia Lorrison, Workplace Consultant at 360 Workplace

important thing is reaching a minimum standard that removes a distraction in each area.

So it's not that we need the most comfortable chairs in the world, we need them to be comfortable enough that we don't constantly notice the pain in our back.

We don't need super quality lighting, but we need them to not be flickering, and switching on and off.

We don't need silent rooms, but we need a space where we aren't constantly pulled into new conversations.

And equally, we probably shouldn't set up our playful area to be overlooked by the boss's office.

William McCabe, founder and CEO at Focus

Periodic table of healthy productivity

T Temperature								
Ca Carbon dioxide	H Humidity	Tv TVOCs						
P Pollutants	Ni Nitrogen dioxide	Pm PM2.5	Q Quiet space	Co Collaborative space	Cr Creative space	M Meeting rooms	St Strong wifi	
Mo Mold	Li Lighting	No Noise	Br Breakout rooms	De Desk space	St Standing desks	E Ergonomic seating	Pr Productivity tools	
V Ventilation	Pu Purification	A Aesthetics	PI Plant	N Natural light	Wo Workplace design	W Wall colors	Db Desk booking apps	

Environmental factors

The space

Technology

Intangibles

Rd

Removing distraction

Green credentials

Is

Insulation

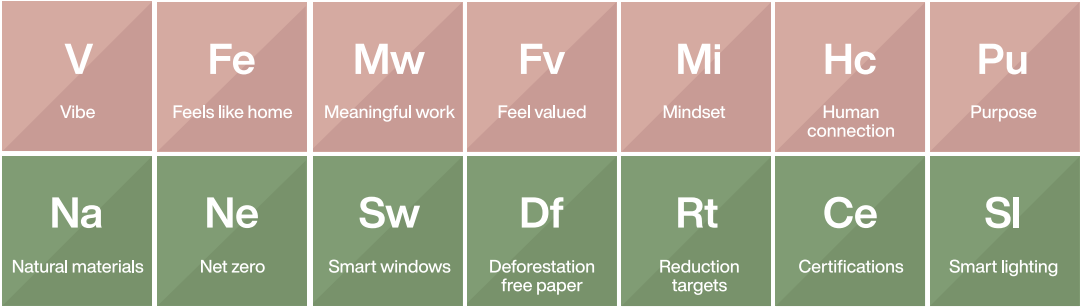
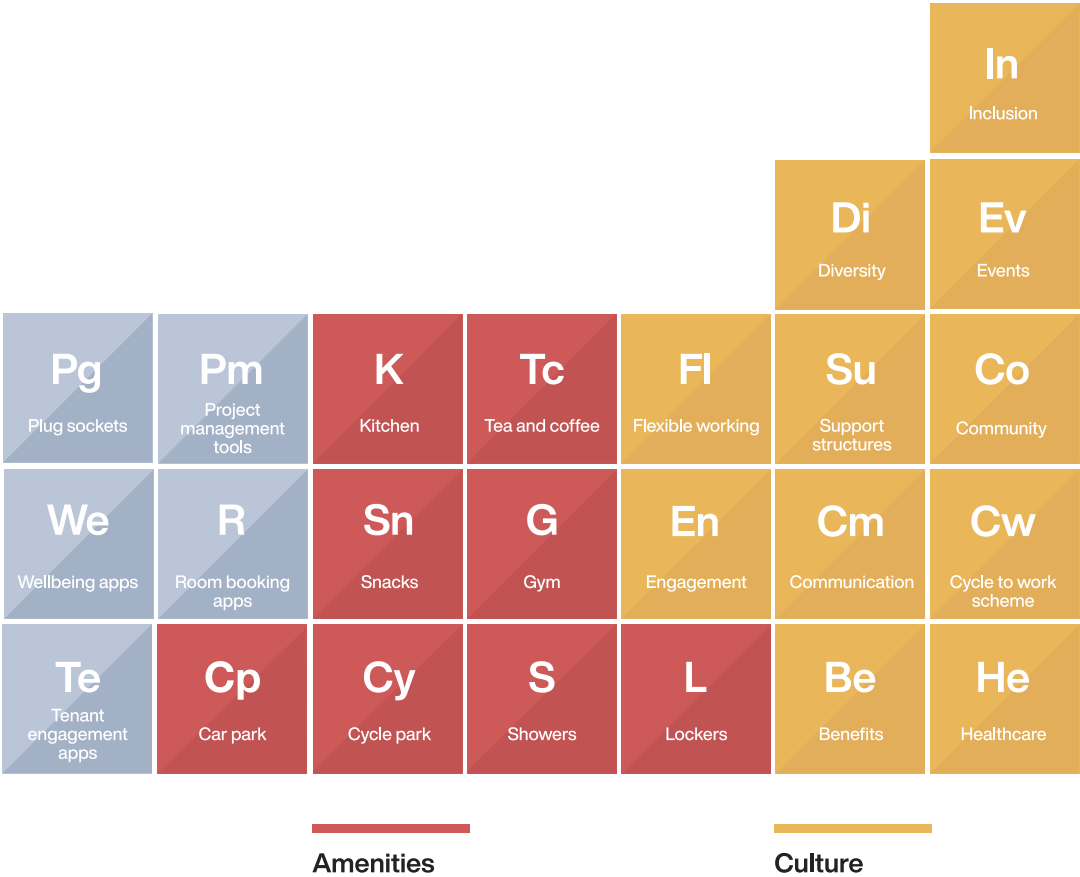
Re

Recycling

Wc

Water conservation

The elements that make
the places we work safer,
more sustainable and
more productive.





Curating the vibe: how creating productive spaces goes beyond the physical

Caleb Parker, founder at Bold

Bold

Caleb Parker is the founder of Bold (acquired by Newable/ NewFlex in 2019), believes in "challenging the status quo" and is a champion for entrepreneurial and innovative thinking. Caleb has served as founder, board member, advisor, investor and consultant to numerous startups and small businesses, and has a keen focus on innovation and technology. Caleb has been a guest lecturer, speaker, and moderator for topics such as entrepreneurship, the sharing economy, the future of work and Commercial Real Estate at academic institutions and large corporations.

If you know me, you'll have heard me say this a million times: we don't need to go to an office to get our work done. During the lockdown years, we learned that most of us really don't.

But we also learned that the value of face-to-face was felt by almost everyone when we finally were able to come back together.

So if we think about those two things, we don't need to be

together every day anymore. So when it comes to choosing a place when we do come together, the main thing I think we should be looking for is vibe. What vibe fits what we want? And so the questions around that are how do we feel when we walk through those doors? Is it cool? What's the service like? Do I feel taken care of? What's the community like? Can I be inspired here? Those are sort of the things that I think about as an operator; how do I answer those questions for people? How can I provide them a place that's going to help them, that's going to be better than a home office would, or, say, a local cafe?

If you ask 100 different people those questions, you're going to get 100 different answers. But if I think about a specific persona, in our case, when we talk about Bold or The XCHG at 22 Bishopsgate, it's people who are creating new things, who are getting ideas out there into the world and building businesses around them. What does that person need? What is going to make them feel taken care of? What is going to motivate them? What's going to make

them specifically feel like they're part of a community, like they're around other like minded people.

They're not going to be there every day, so we really have to think about that. So when they do come in, how do they – from a practical perspective – want to work? I was in the XCHG the other day and noticed that one person had moved around four different times. I noticed that she took many breaks throughout the day and when she came back to work, she didn't want to go back to the same setting. She wanted to sort of shock her system to get her thinking a certain way.

So sometimes you might be sitting by the window and you've got great views and other times you want to go in an area that is perhaps more blocked off by the bookcases and you can just get into focus mode. What I take away from that is absolutely making sure that you have a variety of work environments that people can tap into or plug into for short times.

I almost don't want to say these next points because they're so basic,



"We need to be thinking really carefully about who we are serving and create a vibe for them specifically. This is what it comes down to: it's about understanding the people who are using the space, understanding what they need and providing those things."

but they're also foundational: Is your workspace easy to access? If the WiFi is good? Are you removing friction? It's all the things that someone could want for in a day that they can get at home. I'm making sure that that's there for them as well.

And I think when it comes to curating the vibe in the community and attracting people that are like-minded, it's about putting things around the work day. What I mean by that is, some sort of event, or what I'm going to call an 'attraction', that makes people say, 'I'm going to come in because this is going on'. And then as a worker I'm thinking, because this is going on, other people that are like me are going to be there too; it's about creating FOMO.

So from our side – the operators' side – it comes back to the customer. We're creating these communities here at XCHG with PropTech and FemTech for example, so we're thinking about what does a FemTech founder need, or someone who's managerial level in PropTech? Even more broadly, what does anyone with a growth mindset need? You can go really high level

with that. And then you can dive in specifically to female leaders, or early stage founders or late stage founders. There's all sorts of ways you can do that, whether you're a community for innovators and entrepreneurs like us at Bold and XCHG, or a community for photographers or other industries, or a community within a specific company.

We need to be thinking really carefully about who we are serving and create a vibe for them specifically. This is what it comes down to: it's about understanding the people who are using the space, understanding what they need and providing those things.



A tale of two twins: Joining up our thinking around people and spaces for hybrid

*Josh McDonald, Global Connected
Workplace Lead at Avanade*



Josh McDonald, Global Connected Workplace Lead at Avanade, discusses the value of digital twins for workplace planning and strategy.

Firstly, we need to be sure we're discussing the same thing. As per the Digital Twin Consortium, a digital twin is a virtual representation of real-world entities and processes synchronized at a specified frequency and fidelity.

What's important is digitizing something which is present in the real world and having a mechanism to keep this up to date. Such a twin can be a reflection of that real-world entity, or a simulation of it.

Let's start with a twin that helps us understand space and the place(s) in which we work

The office is a prime example. Understanding occupancy by tracking the use of desks, rooms, collaborative areas – and even socially focused areas within an office – we can understand the demands for different types of spaces – are they ad-hoc or connected to a reservation, and how much time is spent in each?

This depth of understanding can draw out unmet needs. For example, if large boardrooms are used for ad-hoc, smaller-sized meetings, it may be because the resources in these rooms, such as virtual meeting apps, allow convenient collaboration with people working from home. We can also combine this with environmental conditions to understand whether areas are used for 'noisier' types of work such as workshops, or quiet 'heads-down' activity. This is on top of the opportunity to see whether you are heating or cooling these areas relative to whether or not they are used.

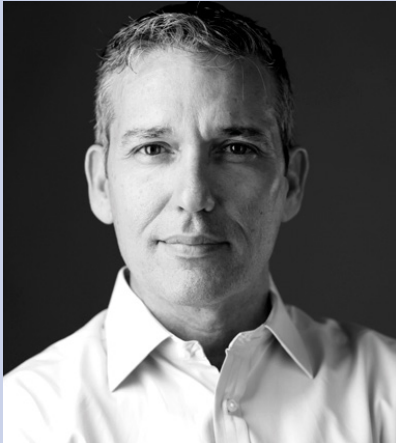
Creating a digital twin of people – here, a workforce – is an opportunity to capture a richer picture of the habits and demands of that workforce

On an individual level, an employee can also gather insights about their own working life by tapping into data from sources like Viva Insights.

Building a data picture of people can create concerns about privacy or a culture of micromanagement. Fortunately, there are clear ways to mitigate or even remove this risk. Individual-level metrics can be limited to only the individual they refer to. For a workforce-oriented twin, the power is in the aggregation of the data, which means that it is always depersonalized. The primary focus of this data is to identify long-term trends to inform strategy and decision-making.

Creating insight by combining the two is where even deeper value can be unlocked

Matching up when people have booked in-person meetings or a desk at the office can be combined with space utilization data; this presents an opportunity to not just reshape or repurpose the office but also influence the working culture. For example, if you know who is going into the office, you're able to decide when to go in, and from there plan your day around that. This gives hybrid workers control to plan for collaborative or lone work.



Navigating the office of the future

*Tony DiBenedetto,
CEO at Appspace*



Employee work experience is everything right now. Clear communication across all worker types – hybrid, remote, in-office, and frontline, is vital. Tony DiBenedetto, CEO at Appspace, walks us through a connected communications blueprint.

When the global pandemic shifted workplace dynamics, organizations and employees scrambled to navigate new work realities and routines. Once the economy started to recover and return to ‘normalcy,’ productivity paranoia crept in, with many managers finding it difficult to gauge their teams’ productivity without physical presence and cues.

New ways of working also reoriented employee expectations and priorities, such as a desire for improved internal communications and greater flexibility. Employees now want HR policies and tools to reflect today’s workplace realities in ways that best support their physical and mental wellbeing while driving team engagement. Organizations must balance these new employee expectations with the need to remain competitive in the marketplace.

Shift to outcome-based goals

More organizations are starting to connect employee satisfaction with company success and taking the necessary steps to meet market demand. In fact, many organizations are increasing hybrid schedules that accommodate employee work preferences, while ensuring company goals are met. By shifting the focus from quantitative metrics, like time spent on a task, to qualitative metrics, such as the quality of ideas, the equation between employees and their managers becomes more about collaboration and trust — even in hybrid settings.

Design spaces with a purpose

At the same time, organizations can strive to make the workplace more productive for employees working from office buildings. To maximize their in-office time, employees want environments that enhance collaboration. Therefore, hybrid workspaces must be designed thoughtfully to inspire productivity and team engagement.

Employers also should weigh the pros and cons of purchasing decisions

regarding cloud services, collaborative online workspaces, and internet connectivity options. Cost savings are always a consideration; however, organizations must ensure employees have the tools and technology they need to remain productive.

Tap technology to encourage productivity and create connections

Companies can achieve a lot with the right combination of technology and planning. Technology provides incredible avenues to enhance employee experience and unlock higher productivity levels. Here are a few specific strategies for using technology to create better workplace experiences for all employees:

- Start by making it easy for employees who no longer have an assigned office or desk to come into the workplace. Hot-desking and desk hoteling are increasingly common needs as organizations reduce their Real Estate footprints
- This is where space reservation technology can play a major role. Modern space reservation

tools enable employees to see the office layout from their phones and book a preferred space. Employees can make their reservations before going into the office or even after they arrive. Having this flexibility allows employees to start their workdays without added stress

- Using digital signage in the right places helps keep teams connected and updated on important workplace news. Digital signage makes it possible to broadcast critical information, such as policy changes and safety guidelines to factory floors, warehouses, and other staff-only areas so that no one misses out on timely news

Meet employees where they are

Take the case of frontline employees who are mostly 'deskless' and often left out of the workplace communication loop. Given the nature of where they work, frontline workers may not have access to the same technology as their colleagues who work from traditional offices. In these instances, an employee app may be the most optimal solution to reach employees anytime and anywhere.

Use tools that work for HR and the business

The choice of tools and resources companies implement should consider everything from the industry's nature to the potential future setbacks. For instance, how do you ensure consistency in tools for a manufacturing business spread across multiple locations?

Listen and act on feedback

Employee feedback can provide valuable insights into what's working for them and what's not. It's important this feedback exercise also addresses software and tools. Direct input from the technology end-users can unlock various possibilities, helping leadership better understand scalability and the potential for advanced integrations.





From renting spaces to being customer centric

Alfredo Díaz-Araque Moro, founder at Spanish PropTech

SpanishPropTech

Alfredo Díaz-Araque Moro has extensive experience in Real Estate (over 20 years), becoming involved with PropTech and digital transformation in the industry from 2015. He launched Spanish PropTech in 2017, the first non-corporate initiative in the Spanish language in this area. He is a teacher in different business schools and a speaker in PropTech events. He has worked in companies like Rodamco, Banco Santander or BNP Paribas as well as startups like Citibox, Spotahome and Prontopiso where he was the CEO.

“Location, location and location” has been the key principle in the Real Estate industry. If you have a good location, who cares about the people? But technological and social changes have shown up in recent years transforming how we live, how we work and how we enjoy our free time. So the industry has discovered a new key element: the customer.

Wait a minute – we have a customer?!

These are not my own thoughts, but I endorse them word for word.

These thoughts were exposed by Méka Brunnel, CEO at Gecina, in Propel by MIPIM held in Paris in September 2020 in the peak of the COVID-19' crisis.

Brunnel said that crises do not create trends but accelerate them and that is what happened in recent years. While other industries have focused on customers and have taken care of them for years, Real Estate has started to focus on occupants because of the health crisis.

Shopping centers have been ahead but now all the sectors in the industry are developing their strategies that put the customers in the center.

Rental residential, for example, has created more comfortable spaces to live, with common spaces to interact, cook or relax.

Logistics is now not only for storing goods. The warehouse robotization draws specialized workers who spend 40 hours a week at work and have needs that must be covered.

It is true that certifications like WELL, since 2014, have aimed to “transform our homes, offices, schools and other

environments by placing health and wellness at the center of all design/build decisions”, but it has been more a nice to have than a must.





The workers' needs have changed

In the first months after the height of the pandemic, workers asked for hybrid systems where the time in the office should be devoted to collaborating and sharing knowledge and tasks (meetings, etc.). But recent surveys show a new perspective: workers want office spaces that allow them to focus on their work. That is the new driver to come back to the office.

The 2022 U.S. Workplace Survey from the Gensler Research Institute shows this trend and brings to light the fact that workers do not feel that their office spaces enable focused work. The 2022 results put that concept at an all-time low from 15 years ago.

In the same survey, the second reason to come back to the office is the access to technology. Clear as crystal. Workers ask for a new office concept: they want to have the required elements to be more productive. That request is not only for their employers. This flows to workspace owners too.

Location, location, location + customer experience

We come back to the beginning of this article: Location yes but with a customer-centric component. It is not good enough just to rent square meters anymore. It is to offer experiences and more comfortable spaces to work.

If we want more productive spaces there is only one way: to ask for, understand and offer what our final customer – the worker – needs, wishes and hopes for.

The Real Estate market is in the middle of a transformation: we are moving from renting spaces to being more customer centric. Whoever reaches this new mantra before the rest will have more chances to succeed in this new market paradigm.



Employee productivity: Data and trust work best for your business

*Richard Gregory, Global Head of
Value Realization at Avanade*



The adoption of a hybrid work model is arguably the biggest shift in human behavior we've seen in a lifetime, says Richard Gregory. Here, Richard dives into strategies that foster more efficiency and effectiveness at work.

I don't know any organization that's going to be successful in the future if they don't offer hybrid work. The pandemic has changed working patterns and the new workforce demands we're seeing are, in truth, kickstarting better business outcomes.

At the start of the pandemic, many organizations had to adapt overnight. Two years went by, and suddenly we think that we can work productively in a hybrid environment. We need to understand how physical real estate is being used to successfully explore structures in our physical workspace that enable this new world of working. Are we connected to our digital workspaces? When you're in the office, how easy is it to log into the WiFi or check into a desk? How easy is it to find out who's in the office and who's not to make sure that you go in when the rest of your team is there?

Then there are the expectations and trust issues surrounding hybrid. Microsoft's Work Trends Index Report (September, 2002), revealed a vast chasm of thought between workers and management: 85% of CEOs found new working patterns less productive, yet unsurprisingly, 87% of employees felt quite the opposite, finding hybrid productive.

"The pandemic has changed working patterns and the new workforce demands we're seeing are, in truth, kickstarting better business outcomes."

There's also a disconnect that we haven't quite solved because people aren't seeing each other. **Cross-team collaboration reduced by 37% during the pandemic and this way of working is directly linked to business innovation.** Also, CEOs don't have a pulse-check on the business – it's not as easy for execs to walk around the office and get a sense as to what's really going on.

Companies need to put different strategies in place if they want their employees and organizations to thrive.

Give voice to experiences

For managers, facilitating open conversations across peer and team networks means that individual teams can come up with their own ways of working that are centered on accountability and trust, as opposed to leaning on the organization to do this for them. We help these conversations evolve so that rules are created within a group or team, as opposed to being dictated by senior colleagues.

It's interesting to consider 'productivity paranoia' – the term Microsoft coined while researching workplace behavior. I believe this challenge comes down to corporate culture. **If an organization has created an environment where there's a lack of trust, employees are constantly having to prove that they're productive – in what is probably, and ironically – an already unproductive environment.** Leaning in and establishing trust, however, can have a significant impact. All 60,000 Avanade employees are now enrolled in a self-regulated flexible

working scheme, and we've seen a measured improvement in productivity and employee satisfaction.

When helping organizations improve workplace experience, you can look at things like pulse tools and pulse surveys for intelligence around employee satisfaction, and these things link directly to employee productivity.

But it would also be interesting to compare employee engagement surveys with pulse trends to understand how people feel about office-based versus home-based working. Are we really understanding where and how people feel they work best? Many workplace experience apps make you believe you've been more productive because you earn a few widgets.

Today, we can collect deeper data: how we interact in virtual meetings, what emails and chat messages we send, and whether we're multitasking on a conference call. These are meaningful signals that can indicate whether hybrid is truly successful or not. You'll also need context if you're going to implement the right structures, processes, and policies for productivity enhancement.

Looking at recent work surveys, people in their 50s are most likely to want to work fully remotely and hybrid. Those that have just started their careers, like interns and graduates, are actually the ones who are crying out to be in the office – the exact opposite of what we might expect. Equally, you'll need to look at the different work that needs to be done within an organization: it's not as clear cut as saying 'everybody in the UK can work three days a week'

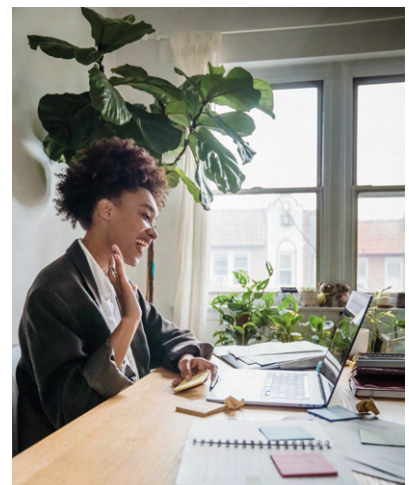
because if you're in product management, the chances are you need to be in a collaborative environment.

Why merging physical and digital workspaces is critical

Assuming that everything's going to be all right because the CEO or HR has decreed that everybody can work in a hybrid manner, doesn't mean that concrete steps have been taken to accommodate hybrid. Obviously, this impacts when you think about sustainability and office space as being one of – if not the most expensive – costs within an organization.

There are some huge opportunities with hybrid work from an employee experience as well as a financial and macroeconomic perspective. From an organizational standpoint, think about how to change the physical workspace and morph physical and digital workspaces together to break down frictions and barriers and make life as easy as possible for all your employees. In doing so, you'll create better teams and gain better business outcomes. Tech must be implemented in a considered way to power employee engagement, trust, and productivity.

"Today, we can collect deeper data: how we interact in virtual meetings, what emails and chat messages we send, and whether we're multitasking on a conference call. These are meaningful signals that can indicate whether hybrid is truly successful or not."





Designing along a spectrum of noise: Getting more out of smaller spaces

Stefanie Sebald, Head of Design at Kitt



Stefanie Sebald has worked as an architect and interior designer on a global scale in Europe, Australasia, and the United States on projects ranging from master plans, large scale and private high-end residential projects, as well as museum quality commercial interiors for retail, hotels, hospitality, and innovative workplace design. She now brings her design acumen to Kitt, the managed office provider.

The pandemic has changed a great deal when it comes to workspace. As hybrid work becomes the norm for businesses, the office is being used more often than not as a social hub – bringing people together for at least some of the week to break the tedium of working alone.

What that has created is a notion that all focus work is now done at home, while all collaborative work is saved for the office. And, while to an extent these patterns have emerged, a productive office space still needs to cater for both. It can be harder in smaller spaces, particularly on more social days where

more people are in, but there are a few things you can begin to think about when it comes to your space.

Don't eliminate focus spaces

I've never been able to collaborate for eight hours a day, or sometimes even up to 10 hours a day, however long in the office. When you're going into the office for meetings, it's not always collaboration time. I think everybody can relate to those days when you've got meeting after meeting; you've spent time before that doing the prep in order to really use that time well, and you then have a ton of work doing all the follow ups. It's really exhausting!

So the trick is to allow for both. Of course you need collaboration spaces, but the flip side of that is that you also need focus spaces for getting heads-down work done. You need a place where people can make a phone call, or just sit and do a bit of work. All of these things occur daily, and are quite important to how people like (and need) to work, so don't just eliminate those areas.



Utilize a spectrum of noise when designing

One trick that we are using with some of our clients, particularly in smaller spaces, is to think about designing zones on a spectrum of noise rather than just for functionality. Think about which areas are being used for what purpose.

For example, if your kitchen also doubles up as a social space, it won't make sense to position a meeting space next to it. Instead, you might think about putting another area where conversations are had, such as collaboration or 'whiteboarding' space.



Think of your space as a spectrum of noise, and make sure that focus areas such as desk space are far away from the louder corners of the office. Ultimately, you need to think about adjacencies and what makes sense.

What to think about alongside design

It's not always possible to have certain areas where you want them, particularly if you have less control over the physical layout of your space. With that in mind, the other important thing to consider is the structures and processes you put in place to enable a productive environment.

Space and the way you use it are so interlinked. It's important to have culture champions in your team who will make sure that, during the first month or two in a new space, that certain things are done a certain way. It could be as simple as making sure everyone puts away their plates after they eat, but if everybody does it then people will follow.

When it comes to how you use the space, and particularly with noise

in mind, this could mean ensuring that loud conversations aren't had during meeting hours – or when meeting rooms are being used. If a precedent is set, it becomes a little easier to facilitate a productive space for every type of working preference. Those little things you can't design - they're impacted by the culture, structures and processes.

Thinking about all of these things when it comes to designing your space will contribute to the working environment you create for your team. Workspaces are changing in response to new habits and preferences, but businesses still need to find a balance between areas for creativity and areas for focus.





In the zone: How color can transform the spaces we work in

Emma Bestley and John Stubbs, co-founders of YesColours

YesColours.

Throughout her career, Emma has been guided by an obsession with color and design, working for the World Culture Museum in Gothenburg, fashion buying, events and advertising agencies; BBDO, Ogilvy and Clear Channel. During his career, John has worked with renowned retail consultant and broadcaster, Mary Portas and delivered complex industrial design projects for global brands, including Westfield, Virgin, Panasonic and JosephJoseph.

First of all, we'd love to know how you got into the business of color!

Emma: I have synesthesia, so my brain associates colors with people and numbers. John actually once asked me what color I associate with him and it's brown! Brown is a really earthy, grounded color and I think it's just something that human beings connect to as it feels more natural. Our friendship stems 20 years and has always been very honest down to earth.

In general in my synesthesia, browns are a good color. Thursday is brown and I love Thursdays! So there's a

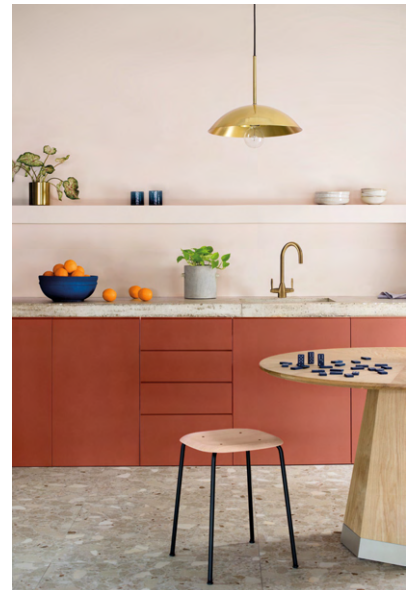
really lovely grounded exciting feel about it; John and Thursdays have got a very good, positive association.

Tuesdays, however, are a cold, cyan blue: I do not like Tuesdays!

Synesthesia is like a different language. 4% of the population has it – that's over like 300 million people – but lots of people wouldn't even know they have it. Interestingly, there's been research on this, and it only started in the late 90s, but if you have a certain type of synesthesia (like mine which is grapheme color synesthesia), you are eight times more likely to end up in a creative role or hobby; you're just going to be drawn to it, there's a path that you can't really avoid.

What do you think is the most important strategy when it comes to using color in the workplace?

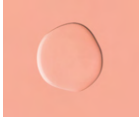
John: Zoning, for sure. I'll use our work at Planes Studio as a case study. The interior designer there approached us purely on the basis that we were talking about color in a different way, talking about wellness, how you want to feel and room, how you want the rooms to be used.



[Our Loving Orange paint colour is warmth personified](#)

It's our burnt orange colour with an undertone of red, a perfect autumnal shade which brings people together, surrounding you with a wise, bronzy, deep clay hue.





Friendly Peach paint

Our Friendly Peach paint is something of a comfort colour and can be known to increase your level of happiness due to it being full of optimism. We all have a friend like this.



Joyful Pink paint

Our Joyful Pink paint colour is our bestselling pink as it can easily fit any space or interior scheme. Truly a diverse and adaptive paint shade, and the epitome of 'Millennial Pink' (yes, this is still a thing!).

A big part of this project was using pops of color in different areas. Zoning out areas, particularly in commercial spaces, is so, so important, because you want certain areas to be used in certain ways versus others. Crucially, color has a massive impact on how you feel in those spaces – you have to think about whether people need a space to feel calmer, or more productive.

In Planes Studio, we worked with interior designer, Alex Pepes and used Fresh Peach and Fresh Lilac in their boardroom paired with some original abstract art. We then used the more joyful, saturated pink pastels used in places where people were going to have meetings together, or in cubicles where people would be doing recordings or private calls (such as Joyful Pink).

You really have to think about the purpose of the room or area; after that, it's about mixing and matching according to the space. It's so important to us and the way that we work that we've organized our palette by these emotive objectives, so you have things like Calming Blue, Friendly Green, Serene Pink; we guide the customer to these groupings of colors according to how they want to feel in a room.

So what sort of colors should we be using in places where people are working?

Emma: When you have a few people in one space, it's ideal to have a form of a warmer color, like a pink that is often seen as nurturing and bringing people together. Hues of orange can be really good for places where people are socializing or even where they need to focus for short bursts of time in a team.

Aside from research into what colors are good for workspaces, I think there's a sense of energy in these pink and orange colors that doesn't drain you. And they're not too intense (yellow for instance is sometimes a bit too intense), so it's that sort of safe zone on the color wheel where I think ignites some energy, or taps into a certain part of the brain.

I've actually just decorated my own office, and I've used our Friendly Peach; it's got a Miami feel, a very vibrant pastel, because I really liked the warmth of it!

John: As well as that, I've worked in so many offices that have been painted this standard bright white. I find that very, very stark and almost overbearing on me, because I'm

looking at my screen and then there's all this white around, and it's all like it's a bit of an assault on the senses.

Personally, I'm much, much better as a person at low light levels. I don't use the lights on the ceiling at home, so I've got little side lamps which makes things much softer and helps me to get the best out of my day in the way that I work. So for me, it's about reducing those stark, bright colors, and bringing in the softer pastels.





Passionate Teal paint

Like the blue in the YesColours Passionate Collection, this is a deep, stable paint colour. It has a natural dignity and is certainly not an extrovert. The blue in this Passionate Teal paint provides tranquility but the green boosts the energy completely. What can we say, the perfect balance!

Let's say you have an office that's painted white and you're not able to do a total renovation – what are some low-effort, low-cost options to bring some color in?

John: As well as zoning, I'd also say accents can be a quick win. You can look at window bays, window sills, skirting boards; they're all places where there can be an exciting little pop of color. I love it when you enter a room and it just looks all white, and you shut the door behind you and there's a flash of electric yellow. That's what adds the fun into it!

A vibrant, bold color used sparingly can have a really great impact in a space. An example I love is that as part

of the Habitat collaboration we did recently, the theme was Grounded Simplicity. What we did was paint a skylight our passionate olive green. I really don't think people would usually think of doing just the skylight and even that color, but actually, as the light hits, it creates such a vibrant impression of the color; it elevated the space without dominating the room. The theme was all about keeping things minimal without being cold and I think that worked perfectly.

What else do you think about when you're working on a new project?

John: The actual function of a space is so important. That's one of the reasons why we're developing

the antimicrobial paints. When it comes to coworking, or commercial environments in general, you want it to be as healthy as possible in that environment. Helping to make people feel safe in their workspace goes hand in hand with the importance of making people feel how they need to feel in their workspace.

We've worked with places like hospitals, schools, mental health facilities, that have shown a huge interest in the impact of color, but also in keeping their occupants as safe as possible, so these antimicrobial features of paint can be part of their story of protecting their people.

Emma: We're about to embark on charity project in London, and they

have this huge space that they use as a shelter, and it's all about how the charity wants to use those spaces and how they want people to feel in them.

Again, color zoning is so, so important to that, even just as a way of denoting wayfinding in the space, letting people know to go to the yellow zone, or the green zone. It's a practical thing for them to do to enable people to use the space slightly more easily.

And because it's a homeless shelter, if you left it all white, it would just feel so clinical and not really welcoming. Where's the joy? Where's the personality? Instead, we want people to feel safe and comforted, so I think injecting color into a space like that is really vital for people's mental health and wellbeing.

In places like coworking spaces or big offices where there's lots of people coming together who all respond differently to external stimuli, what are some guiding principles on how you can choose colors?

Emma: When I was working in my previous career at Clear Channel, I was lucky enough that when it came to redecorating and choosing the colors, we all got to vote on it! That was so important as we were the ones who would have to sit and work in that space all the time, surrounded by the colors. It was a great way of collaborating with office management, and for us to realize that they actually care what we think.

Now I know that's probably quite unusual, but it's not difficult to facilitate some discussion. Not everyone's gonna agree but then there's compromise there.

John: Certainly with commercial spaces and coworking spaces, the

brand factor comes into it as well. In my former life doing interiors and working with big brands, I learned that it's important for a brand to not over-brand their spaces.

I'll use Virgin as an example. Obviously the Virgin red is so strong, and it'd be easy just to drench everything in red. But instead, you need to create that little red thread that runs through everything that you touch. It was more about creating memorable moments throughout the journey of the space. So when you arrive, what's that moment where you cross that threshold into Virgin's space? And what does that moment create for that customer or employee? And how does color, texture, and light come into that moment?

A really cool way to do this is by creating a color palette that hints towards the brand colors, rather than just being the brand colors. It's about injecting color in ways that doesn't just dominate, but also has a brand function.

Going back to Plane Studios, if you look at their workspace and then go on their website and look at their branding, it makes total sense. I love that the use of color in their space isn't just a cartoon version of their brand, you can see there's a connection. If that's done well, it's a lovely detail to celebrate.



Electric Blue paint

Our bestselling Electric Blue paint is the epitome of Electric. It's magical how a paint colour can be so beautifully vibrant, and almost like velvet once it's dry. You can get lost in this ultramarine blue shade and as Yves Klein, the artist and colour creator once said "Blue has no dimensions, it is beyond dimensions".





Staying focused and managing distractions, wherever you're working

*Laila Dattoo, Workplace Wellbeing Expert,
Mindfulness Trainer at a.life.more.mindful*



Laila Dattoo is a certified mindfulness and performance coach and created a.life.more.mindful to help well-intentioned but time poor business leaders and HR professionals to build happy, healthy and profitable workplaces. Laila has provided practical yet transformational solutions that have helped hundreds of professionals to beat stress and manage their mental health, from public sector organizations like the NHS and universities, to multinational corporates like Accenture and Hyatt.

What's the first thing you do when you sit down at your desk about to start work? Look at your to-do list? Check your emails? Scroll social media while you decide what to do first? Sit down and then get up to make a quick cup of tea?

It may feel like "easing into the day", but these actions could be seriously distracting and, accumulated over the work day, can cost you hours of time, buckets of leaky energy and that all translates to lost money – whether directly or indirectly.

Whether you're working from home or back in the office, distractions are all around us.

Distraction = procrastination = bad habit

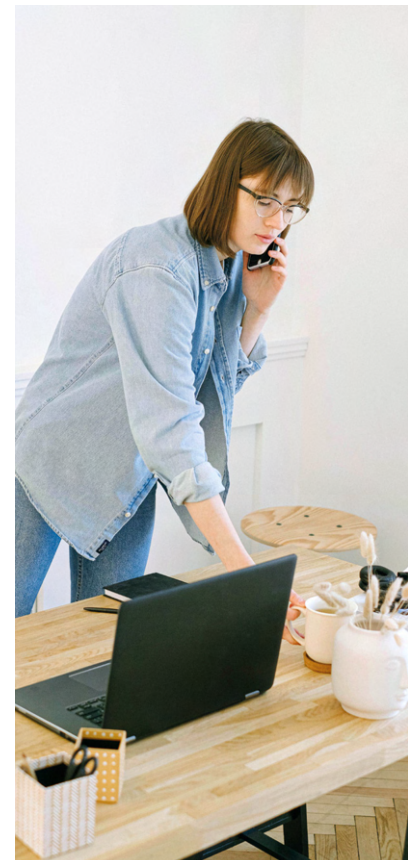
You know that wonderful feeling called "flow state"? When you're cruising along, ideas are flowing like warm chocolate, you're in your power zone, killing your to-do list, feeling like a genius?

A 2015 study from UC Irvine shows that every single time you get interrupted, you get knocked out of your flow state. And then, after each disruption, it takes you approximately 23-30 minutes to fully re-enter your flow.

In other words, that "tiny little 3 second distraction" (a quick email check, a social media notification, an Amazon delivery knock at the door...) is actually a 30 minute setback.

Do you have 30 minutes to waste, numerous times a day? You most certainly do not!

How can you get more focused regardless of your environment and turn distractions into intentional welcome pauses?





Change your habits, focus your flow

Be intentional about how you start your day

If you're in the office can you create a ritual to start the day like listening to a podcast or music on your commute.

WFH can look like creating a ritual to start your day like making a coffee, putting a certain playlist on or even lighting a candle.

You can also turn your WFH "commute time" into a positive way to start the day like exercise, reading, meditation so you don't go from bed to desk.

Create the optimum environment

This is often the hardest one for people who struggle with being back in the office. Home can feel isolating and disconnected, while the office can be noisy and overwhelming. Take some time to work out what the optimum environment is for you to get your work done.

It could be things like:

- Listening to music when doing certain think-heavy tasks
- Perfecting the scents, lighting, views
- Tidying your desk
- Having collaboration close by

Then work out how you can achieve this no matter the environment. For example, if you work well with collaboration, set your office days for when colleagues are in so you can catch up. If you WFH, create an online collaboration space where you can co-work and co-create.

Set a timer and focus your tasks

Organize your tasks into time blocks: if you have a big task to do, chunk it down into smaller tasks.

Decide how long your work sprints and then set a timer: 25 mins work and 5 min break can work well!

Decide what task comes first before you sit down. If you can,

write your task list the night before so that when you sit down, you are clear what you're doing.

Turn distractions into rewards

Instead of sitting down at your desk, procrastinating about where to start and then getting up to make a coffee/check the post/insert another distraction here, use those activities as a reward after your work sprint.

When you focus on what you need to do and you know you have a reward coming, it can help you knuckle down to get the task down.

Every few hours, schedule in a longer break – for lunch, exercise, a walk, an activity that can decompress your mind.

Put into place even one of the strategies and notice how your distracted moments reduce and your focused time increases. As with everything it's about trial and error so try something out and see how it works for you.



Effectiveness: when we broaden our view on experience, we can begin to design for productivity

Corinne Murray, founder at Agate Studio

© 2023 AGATE STUDIO. ALL RIGHTS RESERVED.
AGATE STUDIO

Corinne Murray is founder and CEO at Agate, a future of work, workplace and employee effectiveness consulting studio. For over a decade, Corinne has been a thought leader and expert at companies like WeWork, American Express, RXR and CBRE where she created and tested new workplace and organizational designs to foster healthy employee experience and company culture through the lens of effectiveness and productivity.

Hot take: the way we have designed for employee experience in the past decade has done more harm than good and, unless we change course, we're going to repeat our mistakes by solving the wrong problems. And this will be costly.

Yep, I said it. I – a workplace strategy, change management, employee-experience bleeding heart – will die on this hill.

Why? Because, for a long time, companies have approached "experience" with the objective of "how do we keep you in the office?" rather than "how do we help you do the best work that serves you and the business?"

Employee experience has been broadly defined by perks and amenity wonderlands. The mission with these kinds of offerings was to reduce distractions from the outside world – transportation, company offsites, dining and hospitality, laundry, fitness, healthcare, childcare, and more – to keep employees in the workplace, betting on the logic of "more hours in the office = more work done". The crucial thing – and the reason I'll die on this muddy hill – is that this definition of employee experience almost entirely ignores solving for and supporting employees' ability to get work done, feel productive, and drive effectiveness for their organizations.

This is what Agate has been zeroing in on. As the world faces economic headwinds, workplace and experience advocates need to be exacting with how we demonstrate return on investment in programs and processes that don't directly connect to a company's bottom line. It's something we need to be masters of, regardless of the economic landscape, but times like this challenge us to broaden our aperture on how we define experience and

continue building features for the future of work. We have a lot of opportunities in 2023, these are the ones I'm the most excited by.

Ways of working > RTO

Repeat after me: Return to Office plans are not going to save the day.

With RTO, we are coming at the problem from only one angle. RTO plans solve the "when," and "where" of the future of work and place puzzle, but it doesn't solve for the "why," and "how" pieces.

Think about it, how many times have you been in the office in 2022 with the goal of being with your teammates and collaborating, but you've wound up on video calls the whole time? Being physically together and talking through screens might be an even more demoralizing experience than when we were stuck physically separated and talking through screens in 2020. What's the point of being in an office together if we're not actually going to *be* together?

Companies need to accomplish two things that will evolve their RTO plans into realistic and



dynamic programs that work for the employees just as much as they work for the company. First, they need to create a clear and flexible framework around the types of work activities that their employees perform (socializing and wellness count in here, too!) along with when and where they can happen successfully. Second, they need to spend time working with teams as they adopt these new behaviors.

This is not a one-time communication strategy, but a collaboration that supports individuals and people leaders as they adjust to radically different norms and behaviors over time. We can easily fall back into Field of Dreams thinking. Once we build the thing, we assume that it's there, and everyone knows how to use it, and the job is done. But that's rarely the way reality plays out.

According to a 2009 study published by the European Journal of Social Psychology, Philippa Lally determined that, while it takes people 66 days, on average, to adopt a new habit, for some it can take up to 254 days. RTO initiatives plan out a month's worth of programming

and measurement at most, let alone eight months. We cannot underestimate the effort that goes into behavior changes, nor the resources and time required. Don't forget, many people were not called back to their workplaces until September 2021; 540 days after March 2020. It's no wonder this has been such an uphill climb!

Still today, there is a broad swath of workers who see inconvenience and friction when the idea of coming back to the office is brought up. It's up to companies to create a shared vision – meaning, you cannot decide without balancing the needs of the business and the preferences of your employees – for what the workplace does to enable the work to be done (to contribute to the company's bottom line) and the culture to be preserved and strengthened.

The problem with meetings

The problem with meetings is that they tend to get in the way of work.

I can't begin to count the times where I've been excited for 5pm to roll around because I could finally

start to get my work done and I know that I am not in the minority. Far too many of us have had this experience far too many times.

So the question is: when does a meeting actually work? If we don't get to the bottom of this, I fear we will continue living in the "this meeting could have been an email" memeworld.

Turns out, it's back to back (to back to back to back...) meetings that are the problem, especially virtual ones. Microsoft has shared visuals from a small study they conducted that showed the consequences of several back to back meetings on brain activity and the results were, unequivocally, bad. Without breaks in between, the brain experiences continuous and pronounced levels of stress after just four consecutive meetings.

The working world needs to better understand several things about the impact that meetings – especially virtual ones – have on the brain, but the most practical questions are:

- What is the "tipping point"?
- How long does it take to rebound from that place?

If we were to have access to these kinds of benchmarks, companies would be able to design truly human-centered policies, technologies, and behaviors around this knowledge. It could be amazing. Unfortunately, there's no way for us to understand the complexities that would go into answering those questions, but we're not left entirely empty handed.

We now know there is a scientific point of "too much" and we can design the ways we work in the other direction. Even this directional



data gives us tremendous insight on how we can correct course. Just like coming up with clear guidelines around when and why to come into a workplace, it's up to organizations to create similar frameworks for what reasons meetings should be scheduled (reduction), what time of day these meetings should be happening (containment), and how information gets shared to those not in the discussion (distribution).

The benefits to addressing our unhealthy relationship with meetings are twofold. In this seemingly utopian future where meetings have to meet particular standards in order to be scheduled, the meetings that do occur are successful because there are clear pathways to resolving whatever challenges that called for the meeting in the first place. The only recurring sessions you have are for personal and professional development. A world with fewer meetings where we can get our work done in working hours, not get burnt out from endless meetings, find the mental space to be creative and innovative (for the betterment of

your team and organization), actually spend time with colleagues, and live a life outside of work? It sounds dreamy, but it's not far-fetched.

Productivity + Experience = Effectiveness

Productivity has become an increasingly ugly word over the past decade. What started with the highly instagrammable #Hustle-Culture has devolved into companies installing surveillance software on devices to monitor employee activity to make sure they're working when they claim they are.

In October, The Washington Post wrote that worker output in the United States saw the most precipitous drop since 1947. The article defines productivity as "the measure of how much output in goods and services an employee can produce in an hour." This is the cleanest and simplest way to define it, but it lacks the necessary context. Productivity is notoriously hard to measure. No two people work the same way, making benchmark data



New York City, US
Photographer: Jesica Gonzalez

elusive and unreliable. However, even this argument is half-baked. Productivity has just as much to do with an individual's or a team's resources, surroundings, and conditions, but there's no way to capture those data sets.

In 2019 I started researching productivity with the hopes of finding ways to measure more than just the output that someone produces. If inputs like intentionally designed workplaces, technology, HR policies, and more can influence a company's culture, why wouldn't they influence a company's ability to be productive and, therefore, revenue-generating?

It turns out, there aren't any real metrics that encompass what I was looking for, so I started piecing together the definitions for productivity with that of my definition for employee experience and arrived at "effectiveness".

To me, effectiveness is what we've really been after the whole time. Productivity is about getting something, anything done. It doesn't account for the quality of the work that you do, it doesn't account for how easily you were able to get into a state of focus, it doesn't account for the whether you have young kids competing for your attention, or if you know how to get to the 27th floor of your company's Bangalore office for that big meeting when you flew in on a red eye that morning. Effectiveness does because it accounts for the human experiences that can either aid or interfere with your ability to be productive at any given moment.

When we design for productivity, we are designing for humans that we're unintentionally wishing are

machines. It's certainly easier and more predictable this way, but it's also a large part of how we got where we are. Companies, for better or worse, have created cultures and environments that struggle to account for human nature. When we design for effectiveness, we design with the realities in mind that humanity carries entropy with it wherever it goes. It's neither good nor bad, it just is what it is. Effectiveness allows the systems and spaces we design to be responsive, not reactive, and flexible enough to learn with their users; the exact thing that we Real Estate and workplace folks need for the challenges at hand.

The challenge for our industry is no small one, but it's one that can fundamentally change not just our relationship to space, but our relationship to work and society. Who knows, maybe I am talking about utopia, after all. It's up to us to turn this theory into reality.



Castlefield, Manchester, UK
Photographer: Tom Sassi



How to create a sustainable space

Contents:



Left:
[Whitechapel, UK](#)
Photographer: Jamie Kettle

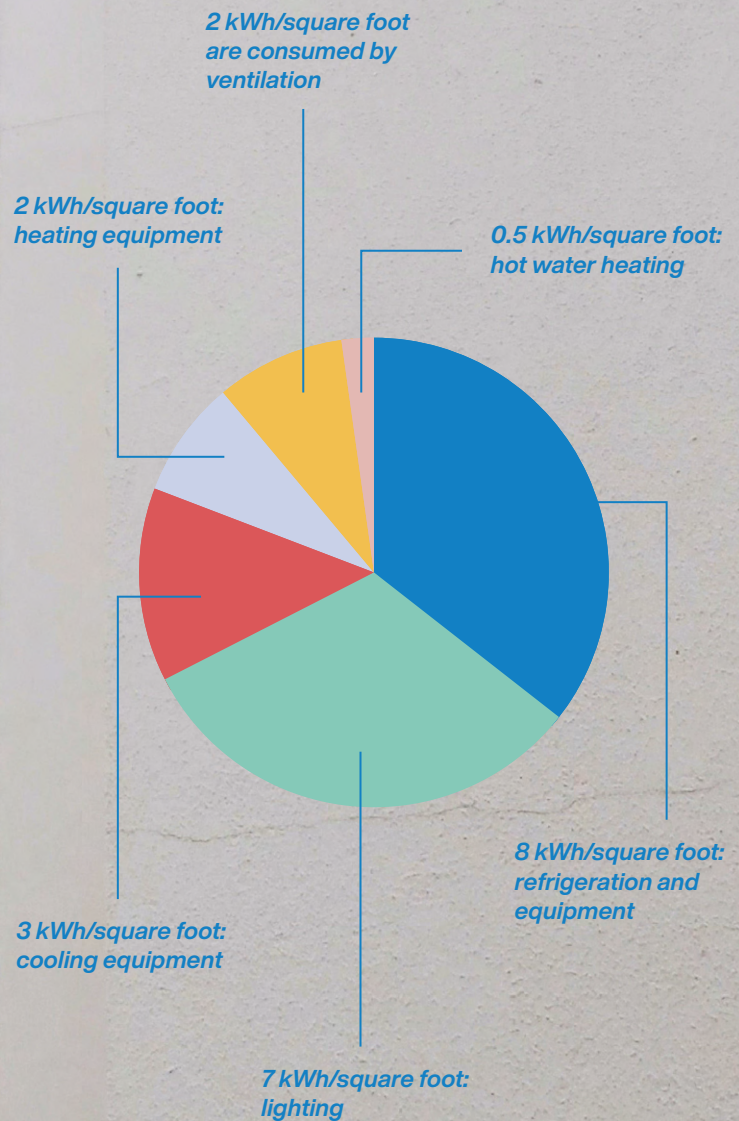
Getting the measure of sustainable spaces	112
Why do we need to make buildings more sustainable?	114
What are some of the key sustainable building regulations?	118
How can we make spaces more sustainable?	122
How does an energy management system work? Sami Mustapha, ESG Consultant at Metrikus	124
How can PropTech help with ESG?	126
How can companies reach net zero?	129
What's next for sustainability?	131
Who cares? Three steps to go green and healthy in the workspace Susana Quintás, Country Manager at Metrikus, Spain and LATAM	133
Making sustainability in food retail easier to digest Rasmus Hyltegard, Director of Advanced Analytics and Retail Industry & AI Capability Lead, and Azure CoE at Avanade and Uwe Klatt, VP of Partnerships at Metrikus	136
A snapshot of tech for corporate ESG goals Laura Fuentes-Dominguez, Senior Manager, Intelligent & Digital Workplace at Accenture	139
Smart sustainability depends on digital Miranda Hill, Innovation and Sustainability Lead at Avanade	140
The sustainably healthy building paradox Francesca Brady, CEO and co-founder at AirRated	142

Getting the measure of sustainable spaces

Buildings and construction are responsible for 39% of global carbon emissions, with energy used to power buildings accounting for 28% (World Green Building Council, 2019).

In a typical commercial building, the energy usage per year is approximately 22.5 kWh/square foot (Twinview, 2022).

Sources of energy usage in the average building





Producing cement – the key ingredient in concrete – generates around 2.5 billion tonnes of carbon dioxide a year, which is about 8% of the global total.

By 2050, it's expected that the number of air conditioning units in buildings will quadruple to 4.5 billion, and the associated emissions will push up the average global temperature by as much as 0.5°C (32.9°F) (Scientific American, 2021).

Producing cement – the key ingredient in concrete – generates around 2.5 billion tonnes of carbon dioxide a year, which is about 8% of the global total. On top of this, concrete consumes almost 10% of the world's industrial water supplies (London Science Museum, 2021).

80% of buildings that will exist in 2050 have already been built, so retrofitting will be absolutely key when it comes to closing this gap and achieving net zero targets (UK Green Building Council, 2021).

We need to act now and take a broad and holistic approach to sustainability that incorporates how buildings affect the people within them, as well as their environmental impact.

Climate crisis

The climate crisis is already impacting every corner of the world, and much more severe impacts are coming our way if we fail to decarbonize buildings and halve greenhouse gas emissions this decade.

Why do we need to make buildings more sustainable?

Climate change could be irreversible by **2030**

One million animal and plant species are currently threatened with extinction

In the next decade, climate change will drive up to **132 million** more people into extreme poverty

Adaptation needs will reach **\$127 billion and \$295 billion** per year for developing countries by 2030 and 2050, respectively

The last decade was the hottest in **125,000** years

Since 2008, floods and storms have forced more than **20 million** people from their homes each year

There could be up to **200 million** climate refugees by 2050

Source: Intergovernmental Panel on Climate Change (IPCC), 2022



ESG

ESG stands for environmental, social and governance criteria, and it's pivotal to the way today's businesses operate. It's all about measuring a company's impact on society, the environment, and how transparent and accountable it is.



- E:** Environmental criteria is the impact a company has on the planet
- S:** Social criteria revolves around people and reputation
- G:** Governance criteria is all about how a company is managed

In recent years, ESG investing has extended beyond financial investments and into Real Estate. And according to Bloomberg Intelligence, global ESG assets are likely to surpass a massive \$50 trillion by 2025.

It's clear that Real Estate is going to be one of the asset classes where the contrast between ESG winners and

losers will be the starkest, as ESG is a measure of both impact and risk. 'Brown' assets and portfolios risk becoming obsolete, while 'green' assets will continue to increase in value.



Changing demands

Occupier demand is shifting towards high quality spaces, and today's tenants are more likely to expect healthy and sustainable buildings.

Honeywell's 2022 Building Occupant Survey Report found that:

- 89% agree that the air they breathe has a direct impact on their health and wellbeing
- 72% are worried about their building's indoor air quality
- 62% are ready to leave their job if their employer doesn't take steps to create a healthier indoor environment

Deloitte's Global 2022 Gen Z and Millennial Survey found that:

- Only 15% of Gen Zs and 14% of millennials strongly agree that businesses are taking substantive action against climate change
- 48% of Gen Zs and 43% of millennials say they are putting pressure on their employers to take action
- 65% of leaders are feeling pressure from their employees to take action on climate change

Asset value

Investors and facilities managers who start future-proofing their portfolios now will create solid foundations for above-average performance and stability.

Compared with traditional buildings, sustainable buildings can yield up to:

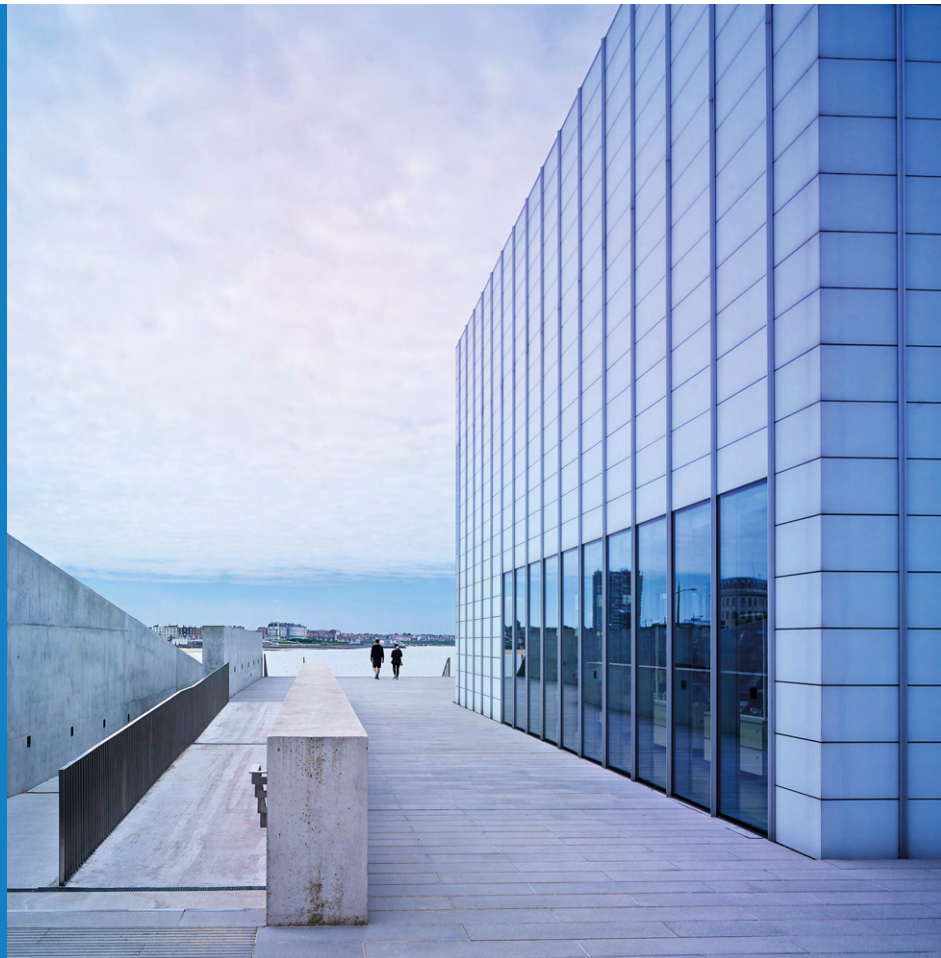
- 23% higher occupancy rates
- 8% higher rental income
- 31% higher sale premiums

Source: International Finance Corporation, 2020



This premium is only going to continue to grow, influenced by stricter regulation and consumer demand.

Right:
Building with people
Photographer: Dave Rowland



What are some of the key sustainable building regulations?



New York City, US
Photographer: Jane D'Souza

Local Law 97 (LL97) – US

LL97 is a regulation set out by the New York City council as part of the Climate Mobilization Act. It came into effect in November 2019, and means that from 2024, all buildings above a specified size will have to comply with new greenhouse emissions caps, or face a fine.

The law affects the following types of buildings:

- Any building over 25,000 sq ft in size
- Two or more buildings on the same tax lot that have a combined size exceeding 50,000 sq ft
- Two or more buildings owned by the same condo association and governed by the same board that have a combined size exceeding 50,000 sq ft

The Securities and Exchange Commission (SEC) – US

In March 2022, the SEC announced an initiative that requires all US-listed compa-

nies to report on an annual basis about how climate change affects their business, including:

- Environmental risk management
- Climate-related factors with a direct impact on the company and its finances
- Greenhouse gas emissions
- The objectives set out in the company's sustainability policy and the strategy defined to achieve them

The cost of climate-related events – like natural disasters and storms – will also need to be explained as a forecast in the company's future annual accounts.





Corporate Sustainability Reporting Directive (CSRD) – Europe

The CSRD – approved by the EU Parliament and Council in 2022 – is the new EU legislation requiring all large companies in the EU to publish regular reports on their non-financial performance.

It will make businesses more publicly accountable by making them regularly disclose information on their societal and environmental impact. This will help to avoid greenwashing, strengthen the EU's social market economy and lay the groundwork for global reporting standards.

The rules will will apply:

- From 1st January 2024 for large public-interest companies (with over 500

employees) already subject to the non-financial reporting directive, with reports due in 2025

- From 1st January 2025 for large companies that are not presently subject to the non financial reporting directive (with more than 250 employees and/or €40 million in turnover and/ or €20 million in total assets), with reports due in 2026
- From 1st January 2026 for listed SMEs and other undertakings, with reports due in 2027 – SMEs can opt out until 2028

These companies will need to publish detailed, standardized data about:

- Environmental protection
- Social responsibility and treatment of employees

- Respect for human rights
- Anti-corruption and bribery
- Diversity on company boards

They will also need to disclose their sustainability targets and green transition plans in line with the Paris Agreement.

To ensure companies are providing reliable information, they will be subject to independent auditing and certification, and digital access will have to be guaranteed. This means that financial and sustainability reporting will be on an equal footing and investors will have comparable and reliable data.



”

Europe is showing the world that it is indeed possible to ensure finance, in the narrow sense of the word, does not govern the entire global economy.

– Pascal Durand, Renew Europe Group

The first set of standards were adopted in November 2022 and apply to all large companies – whether listed or not:

- EU companies with over 500 employees and net €150 million worldwide turnover
- EU companies with over 250 employees and net €40 million worldwide turnover in high impact sectors, including textiles, agriculture, mining and minerals

For nearly 50,000 companies in the EU, collecting and sharing sustainability information will become the norm, compared to about 11,700 companies covered by the current rules. Non-EU companies with substantial activity in the EU – a turnover over €150 million in the region – will also have to comply.

Energy Performance of Buildings Directive – Europe

The Energy Performance of Buildings Directive makes it compulsory for every new building to be a nearly zero-energy building (NZEB) from 2021 onwards across the European Union. For new public buildings, the regulation has been in effect since 2019. Although it takes a softer stance with existing buildings, it still applies in the case of major renovations.

There are also several country-specific regulations, like the Tertiary Decree in France which requires the reduction of energy consumption in the tertiary sector.



Southwark, London, UK
Photographer: Jamie Kettle

Streamlined Energy and Carbon Reporting (SECR) – UK

SECR was implemented by the UK Government on 1st April 2019. It makes it mandatory for large businesses to report their energy and carbon emissions, as well as efficiency measures taken throughout the year, on an annual basis.

SECR affects three types of businesses:

- Quoted companies of any size that are already obliged to report under mandatory greenhouse gas reporting regulations
- Unquoted companies incorporated in the UK, meeting the definition of 'large' under the Companies Act 2006, whether they're registered and unregistered companies
- 'Large' Limited Liability Partnerships (LLPs)

Public bodies don't fall under the regulations, but they are still subject to other legislation involving carbon reporting.

Every company needs to report their Scope 1 and 2 emissions, and unquoted companies are also required to report on their emissions from business travel in Scope 3.

Building Regulations 2010 – UK

On 15th June 2022, changes to the Building Regulations 2010 came into effect.

Part F

- For the first time, air quality monitoring is regulatory for the design and construction of both domestic and non-domestic new builds in England. Specifically, the change means that CO₂ needs to be continuously monitored

Part L

- Non-domestic commercial buildings are required to reduce CO₂ emissions by 27%, and focus on low carbon heating systems



How can we make spaces more sustainable?

There's clearly an urgent need to make our buildings more sustainable.

Real-time energy monitoring does exactly that, giving companies a complete picture of their usage so that they can improve efficiency and reduce consumption.

- Monitor performance
- Detect inefficiencies
- Make automatic adjustments
- Facilitate better decision making

With increasing regulations and pressure for companies to hit net zero emissions by 2050, energy monitoring is going to become more and more important in the very near future.

How does energy monitoring work?

There is often a real lack of visibility about how energy is being used. Office space is underutilized by 30-40% on a typical day – a percentage that's probably even higher since the COVID-19 pandemic – so energy is inadvertently wasted despite some areas being completely empty (JLL, 2017).

To get started with energy monitoring, the first step is to select the right sensor for your purpose. With a range of meters available – including DC, single phase and three phase meters – it's easy to monitor any circuit up to 500 amps. Lots of these sensors also have optional battery power modes for easy installation.

Once energy meters are installed, companies can monitor usage trends from an individual device, to a floor, to an entire building. And this provides granular detail, both real-time and historic, around consumption so that action plans can be developed to improve efficiency.

You can also get alerts when energy usage exceeds normal levels and compare datasets to identify anomalous behavior between different assets, floors, or areas. Energy monitoring can also be combined with occupancy and indoor air quality monitoring to identify even more opportunities for reducing consumption.



The air quality monitoring solution that balances health and energy efficiency in any building.

A scalable solution for any space.





How does an energy management system work?

*Sami Mustapha, ESG Consultant
at Metrikus*



Sami is Metrikus' in-house ESG Consultant. After earning a Master's in Environment and Development, he worked in the corporate relations department at CDP. He brings expertise in corporate ESG reporting and advises both tech and marketing teams on the development of Metrikus' sustainability solution.

Unless your name is Enel or E.ON, decreasing your energy consumption can only be a good thing. Doing so will lower your operational costs, reduce your carbon emissions, keep your tenants happy, and help you progress towards any sustainability goals.

An energy management system helps you do just that – it brings together hardware, software, data, and people to spot inefficiencies in a building's energy use and amends them to lower overall consumption.

The basics

Each EMS provider will use unique strategies and offer slightly varied services, but the basic offering of any EMS can generally be broken down into three parts: data, analysis, and reporting. Data on energy

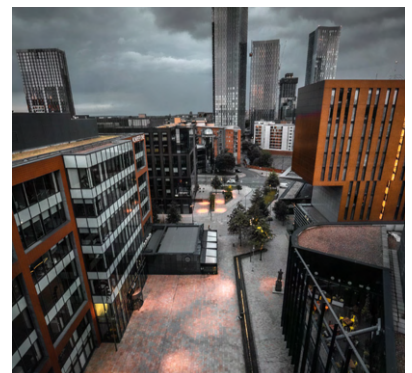
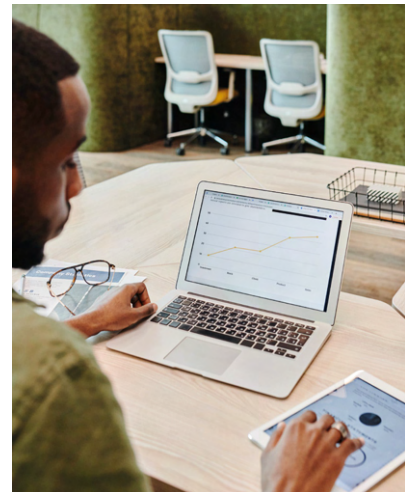
consumption is collected, stored, and used for analysis – which is where the magic happens. Trends, inefficiencies and anomalies are spotted and recommendations for lowering energy consumption are made. Finally, the data and insights can be downloaded to be shared internally, or externally to a third party like Energy Star or GRESB.

1. Data

Collecting energy data can be tricky business. Large companies with multiple, scattered buildings have to rely on various departments to collate utility bills, and the process can be tedious and inefficient. Energy management systems can offer utility bill management services where they automatically receive the bills from the utility providers to sort and store them. To take data collection a step further, smart meters can be deployed to take real-time or interval energy measurements. This is important as data is the foundation of analysis. The better the data, the more in depth the analysis.

2. Analysis

Once an EMS has collected the relevant data, it can produce results



[Deansgate Square, Manchester, UK](#)
Photographer: Tom Sassi



such as energy usage comparisons over certain date ranges, meter comparisons, consumption against targets and budget lines, and so on. Certain EMS providers will also offer financial analyses: these observe spending trends over time and can predict whether you will be over budget in the upcoming period. The energy reduction insights usually come in the form of peak load management. A building's peak load is the period of highest energy consumption over a given period, usually a day. A building's facility manager can utilize an EMS to visualize the peak load, see whether there are any anomalies, and make energy saving adjustments.

3. Reporting

Once the data has been collected and analyzed, the findings can usually be distributed in the form of a report to communicate information on a building or company's energy performance. The report can be distributed as internal communication, or can be exported externally to third party rating agencies.

So there you have it: a brief overview of how energy management systems work. You can't improve on what you don't measure, and using an EMS is a great way to not only measure your building's energy performance, but also to obtain actionable insights that will help you to reduce your energy usage. Better for the planet, better for your pockets.

How can PropTech help with ESG?





It's clear that PropTech can be hugely valuable when it comes to the 'E' in ESG – improving energy efficiency in buildings. But it can be really helpful with the 'S' and 'G' too, even though this often isn't spoken about as much.

Smart technology can not only help with ESG data collection and reporting, but can improve ESG performance across the board.

Environmental

Smart technology can monitor performance, detect inefficiencies and make automatic adjustments via a Building Management System. It's a quick, easy, and cost-effective way to reduce consumption and meet your targets.

Where things get really clever is when you have a software platform to bring all of this data into a single place so that you can track performance. This makes it easy to see if targets

are being hit, or if steps need to be taken to improve efficiency.

Social

The 'S' in ESG often tends to be neglected – mostly because social aspects tend to be much harder to define and measure. Luckily, indoor air quality monitoring has emerged as an easily quantifiable step to optimize employee health, wellbeing and productivity.

Using IoT sensors, companies can monitor key parameters, like temperature, humidity, CO₂, TVOCs and PM2.5. Smart alerts can be used to notify you when these factors exceed optimal levels, so that steps can be taken to maintain a healthy indoor environment at all times.

Instead of making unsubstantiated claims about improving employee wellbeing, companies can get the data they need to prove they are actually doing something meaningful to help their employees.

Left: New York City, US
Photographer: Jesica Gonzalez



Governance

The 'G' in ESG is all about understanding how a company is governed:

- How it makes its decisions
- How its board of directors is established and remunerated
- How it manages risks
- How it deals with shareholders' rights

There are no two ways about it – to achieve good corporate governance, you need good data. And what is absolutely key is that this data can be made readily available to all shareholders and stakeholders.

PropTech gives companies access to high quality data about a huge range of factors, and a smart building platform allows this to be presented in a way that is simple to understand, and easy to interpret and make decisions from.

The right platform can also help to break down data silos and bring data from different systems into one place. This is a great way to create more streamlined and collaborative processes, and ensure that records are transparent and accessible.

PropTech and ESG go hand in hand, and they will both continue to rise on the agenda for investors and companies alike in the coming years.



Above:
[New York City, US](#)
 Photographer: [Jesica Gonzalez](#)

How can companies reach net zero?



In an attempt to tackle the climate crisis, more and more businesses are pledging to become carbon neutral or net zero, but there's often a lack of clarity over what this actually means.

Terms like these tend to be used interchangeably, and there are concerns that companies are using impressive sounding statements for marketing purposes, without really understanding what they need to do to achieve them.

What does carbon neutral mean?

To be carbon neutral, a company needs to measure its carbon footprint (CO₂e) and then carry out carbon offsetting activities to effectively remove the same amount of CO₂e from the atmosphere.

It's relatively easy for companies to become carbon neutral, and while

doing so is undoubtedly a big step in the right direction, the fact of the matter is: carbon neutrality isn't going to solve the climate crisis.

What does net zero mean?

To be net zero, a company needs to reduce its emissions by 90% to 95% – depending on their sector – from their base year. And this is a reduction in absolute emissions, so businesses have to reduce by that amount regardless of any growth during that time.

The final 5% to 10% of emissions then have to be removed using more expensive types of offsetting which permanently remove the carbon from the atmosphere, like direct air capture.

For most companies, achieving net zero in the next decade is unattainable, but it's what we all need to hit by 2050.

”

Carbon neutrality isn't going to solve the climate crisis.

How can you reach net zero?

1.

Understand your current emissions

The most important thing is to start measuring your Scope 1, 2 and 3 emissions as soon as possible. There are lots of free carbon footprint calculators out there to help you out.

2.

Set targets for reduction that are based on science

Once you've started measuring your emissions, you need to set some targets for reducing them. A target is defined as 'science based' if it's in line with the scale of reductions required to keep global warming below 1.5°C from pre-industrial levels.

3.

Deliver carbon reductions and efficiencies

Identify quick wins: switch your offices to renewable energy suppliers and reduce business travel where possible. It's also a good idea to engage the whole team in making reductions, especially if you have employees working from home.

4.

Compensate for your current emissions

Even while you're still figuring out your plans for reduction, you can get cracking offsetting your current emissions. There

are many different types of offsetting, and not all are created equal. It's important to do your research, opt for initiatives that meet key project standards, and be wary of greenwashing.

5.

Build a long-term strategy

For most companies, reaching net zero by 2050 is going to be a big task, but the sooner you get started, the better. Get thinking about your long-term plan now – you won't regret it!



Above:
[Buildings, New York City, US](#)
Photographer: [Jesica Gonzalez](#)

Examples of offsetting projects include:

Renewable energy initiatives

This type of offsetting aims to build or maintain renewable energy sources, such as wind, solar or hydro sites. As well as reducing the use of fossil fuels, these projects also create employment opportunities.

Conservation and rewilding

These types of schemes focus on the conservation of natural habitats, such as forests and oceans. Over time, this will remove carbon from the environment, but has added benefits of boosting ecosystems and protecting wildlife. There can be issues with measuring how much carbon is actually being reduced through these projects, but advances in technology will hopefully make these improvements easier to track over the coming years.

Artificial carbon removal

These kinds of offsets use technology to actually extract carbon from the atmosphere, rather than reduce it. This includes projects such as direct air capture, which removes and stores carbon from the air. This is more difficult to do than other types of offsetting, and is still far more expensive.



What's next for sustainability?

Changes in regulation and legislation

There will be big changes in regulation and legislation – at state level, local government level and country level. Until this point, some companies have still been dragging their heels with ESG, but very soon they will have no choice but to comply.



Changes in demand and expectations

Shareholders, investors and consumers are closely watching what steps companies are taking to meet ESG goals and support the transition to net zero. People will want to understand exactly how this is being rolled out and what goals are being hit, and it will be a bigger part of the decision-making process for prospective employees.

Better use of data

Good quality data will continue to play a key role in ESG, but the way it is aggregated and analyzed will be optimized. Companies will need to dismantle data silos and make building data more accurate and accessible.

Increase in transparency and accountability

Pressure for more transparency and accountability will come from stakeholders across the Real Estate value chain, which will only increase the seriousness with which sustainability is addressed. Greenwashing will become a risk too expensive to run and boards will become more focussed on ESG factors.

Focus on the scopes

There will be pressure for companies to record and report all emissions across Scope 1, 2 and 3 in a central place. Currently, there's a great deal of estimation being used, but we have the tools we need to progress towards reporting across all emission scopes in a more accurate way.

A broader definition of sustainability

We will continue to move towards a broader definition of sustainability, incorporating climate, environment, social impact, economic impact, and diversity and inclusion. There will be an ever-growing need for a more holistic, data-driven approach to buildings that considers people and the planet in tandem.





Who cares? Three steps to go green and healthy in the workspace

Susana Quintás, Country Manager at Metrikus Spain and LATAM



Susana Quintás has spent more than 20 years in banking and Real Estate in C level positions with responsibility for strategy and operations, asset servicing, mergers and asset sales, digital transformation and sustainability. Susana has worked in companies such as Deloitte and Santander and has been a Board Director at Aliseda SGI (a leading servicing company in Spain), 4B, Euroauto-match Cash and Universal Pay.

What's new?

The last two and a half years have seen a massive acceleration of natural disasters, a full-on pandemic, an energy crisis, the 70s stagflation all over again, and a war in Europe in the 21st century. No wonder some people are already talking about the beginning of a new era!

For the first time ever, five generations are in the workforce:

- **Silent generation (1925-1945):** in small numbers and generally an advisory capacity

- **Baby Boomers (1946-1964):** known for being career-obsessed, many with one foot already out of the door
- **Gen X (1965-1980):** the first generation to value work-life balance
- **Millennials (1981-2000):** the largest generation in the workplace with a focus on change, teamwork, and flexible work styles
- **Generation Z (2001-2020):** tech-savvy, highly collaborative and adaptable

When it comes to ESG, companies are finally moving from theory to action as they see a nice-to-have turn into an existential issue.

All of this is driving a workplace revolution – a sustainable office is becoming the new normal.

The new office rules

Sustainable offices are phygital spaces – tech-enabled and data-driven – that promote a productive multigenerational environment and encourage



cross-collaboration. They are flexible and connect the dots between health, wealth and wellness. And importantly, they are committed to reducing emissions to protect the planet.

Three steps to get started with your green and healthy workplace



1

Reassess your portfolio and commit to a net zero workspace

Reassess your corporate Real Estate portfolio – do you really need that much space? Fortune 50 companies occupy 2.6 billion square feet of Real Estate, based on workplace practices often belonging to the last century (McKinsey, 2022).

Your physical footprint can turn into a competitive edge if it reflects your values and strategy. So let your ESG purpose permeate your Corporate Real Estate and commit to achieving science-based net zero targets.

- **For companies staying in the same office:** focus on minimizing energy consumption with real-time monitoring
- **For companies renegotiating their lease:** check the opportunity to move to a WELL or LEED certified building with a good score
- **For companies finding new HQs:** make sure they are built

with the right standards, not only for the construction phase but for the day to day, too

All in all, optimize your office space to make the most of the new hybrid working model – happy employees with happy P/L.

Some companies have shifted to a remote-first approach, like Dropbox which launched a program called Virtual First back in 2021. A year on, they released a report with some of their findings:

- It's harder to build relationships outside of immediate teams
- Managers have never been more important
- Employees need clear communication and education

They also found that 72% of employees feel more productive, 72% feel like they can better balance work and personal life, and 90% of prospective candidates cited Virtual First as a key reason why they would like to join the company (Dropbox, 2022).

When it comes to balancing between in-office and remote work options, companies can make significant reductions to their emissions by ensuring energy is only used when spaces are occupied. For example, real-time occupancy and indoor air quality data can be combined to ensure HVAC systems are only operated when required.

Moreover, the path to net zero is paved by daily habits that can have substantial impact (obvious but not always in place!).

- Use energy efficient light bulbs and natural light/daylighting to its full potential
- Use recycled plastics or reusable mugs
- Make sure all equipment is turned off overnight
- Encourage public and green commuting

And don't forget to invest in meaningful solutions to compensate for remaining emissions like reforestation, conservation and carbon removal.

2

Focus on employee health and wellbeing

Enough of buildings, let's focus on people. Deloitte's 2022 Gen Z and Millennial Survey highlights that both generations are tired of being resilient: they want support and genuine change.

- **37%** of Gen Zs and **36%** of millennials say they have rejected a job and/or assignment based on their personal ethics
- **46%** of Gen Zs and **45%** of millennials feel burned out due to the intensity/demands of their working environments
- **46%** of Gen Zs and **38%** of millennials say they are stressed or anxious all or most of the time

Companies need to make progress when it comes to prioritizing mental health and wellbeing, for example, by allowing employees to take mental health days.

Indoor air quality also has a massive role to play in workplace health and wellbeing. Poor air quality can reduce productivity and cognitive function, as well as causing a range of symptoms from headaches and sinus discomfort to eye irritation and colds.

As an employer it is in your best interest to have a healthy team. You will increase productivity, reduce sick days, and stand out in the market as a top employer.

3

Let your suppliers help you in your journey... because reducing Scope 3 emissions is really hard

Scope 3 includes emissions that are not produced by the company itself but by those up and down its value chain from suppliers, customers, etc. For many organizations, Scope 3 emissions account for by far the highest proportion of total emissions.

Purchasers wield significant buying power, so consider picking supplies with a net zero strategy in place. You can also reduce your impact by procuring 100% of electricity from renewable sources, minimizing business travel, buying more local food, and switching to financial service providers with strong policies on green investments.

Why it matters

A sustainable workplace is key to attracting and retaining the best talent, as well as fostering innovation, connectivity, diversity, inclusion and loyalty.

So, my advice to you would be: protect the planet, stay safe, healthy and productive, and remember sustainability is a journey – not a destination.





Making sustainability in food retail easier to digest

Rasmus Hyltegard, Director of Advanced Analytics and Retail Industry & AI Capability Lead, and Azure CoE at Avanade and Uwe Klatt, VP of Partnerships at Metrikus



Food retail presents huge challenges in sustainable practice. Rasmus Hyltegard joins Uwe Klatt to share insights that deliver tangible results.

Perhaps like no other sector, retail is always evolving, changing, and in flux. Yet time and time again, we see retailers creating marvelous new experiences devised to attract, retain, and impress the elusive consumer. That ability to constantly deliver under intense and constantly shifting pressure is what sets retailers apart. Because let's face it – tomorrow is a new day, and with each day in retail comes new expectations.

Sustainability in retail

Global retail is greatly affected by a breadth of sustainability challenges. Sustainable sourcing, supply chains, transport, storage, warehousing, packaging, waste, and energy consumption are just some of the aspects the industry needs to consider on its path to contribute to the 2015 Paris Agreement's 1.5C target and reach ESG goals.

Crucially, retailers need to retain buyers' and investors' confidence in their brand and demonstrate that

they are a sustainable business. They balance demands for economic growth with economic care and social wellbeing by shifting operational savings into investments toward new experiences destined to make a lasting impact in consumers' minds and lives.

Resiliency and sustainability go hand in hand: a recent Accenture study found that 81% of consumers plan to buy more environmentally friendly products over the next five years, and over a quarter of employees said they would be willing to take a pay cut to work for an organization committed to the environment.

So how can today's technology assist? It all starts with measuring sustainability throughout operations with Sustainability Performance Indicators (SPIs).

Meeting the unique challenges of sustainable food retail

Due to its complex refrigeration, transport, and storage requirements, food retail remains one of the sector's prime focus areas when it comes to achieving higher sustainability goals. Tesco, the United Kingdom's

leading supermarket chain and retail giant with a 26.9% market share, accounts for a whopping 1% of the entire nation's energy consumption. To combat this stark environmental impact, Tesco has committed to switching 100% of its energy supply to renewable sources – an admirable approach that we expect others to follow. In taking the same longer view of problem-solving now for the future, there are systems that can be delivered in the here and now that





can augment existing technology for better performance. There's also technology that provides insights around waste to help you drastically lower energy consumption.

Start by reducing HVAC energy consumption

Much like other commercial buildings, heating, ventilation, and air conditioning (HVAC) systems in supermarkets are controlled by complex Building Management Systems (BMS). BMS systems offer access to crucial data in terms of power metering, as well as the operation of hard building assets such as fans, and heating and cooling units. At the same time, they often exist as isolated, monolithic, decentralized units without providing access to analytic functions to monitor, supervise or correct their operation.

SPIs to improve the situation include store ambient temperature versus footfall and HVAC total power consumption versus store square footage; things that are hard to monitor by people. IoT sensors, on the other hand, are inexpensive, readily available, and can start measuring these SPIs in a supermarket branch in one day.

The key to success is connecting these IoT sensors, as well as the existing BMS infrastructure, to the Cloud and analyzing the data to provide actionable outcomes that lead to the reduction of overall energy consumption.

Food waste, food safety compliance, and refrigeration efficiency

While HVAC performance plays a major role in food retail sustainability in any given outlet, goods refrigeration turns out to be a critical factor in the overall sustainability of the sector. Refrigeration systems often leak because pressures in the system are usually higher than in the atmosphere, and it's believed that between 10 and 30 % of the refrigerant charge in large systems is released each year, contributing to global warming (Handbook of Water and Energy Management in Food, 2008).

Around 1.4 billion tons of food is wasted in the US annually, which is 30-40% of the entire US food supply – and the majority ends up in landfills (Food Waste in America in 2022, 2022). Across the water in Ireland, the Environmental Protection Agency (EPA)

estimates that 60,900 tons of food waste was generated by the national retail sector in 2020 (Environmental Protection Agency, 2022). However, there are ways to better address food spoilage and leaky systems.

In an industry tightly regulated by food safety compliance including EN12830 and HACCP, refrigerators, chillers, and freezers are most often monitored by temperature loggers. These devices record temperatures in typical five-minute intervals and are situated next to food items in refrigeration containers. Typically accessed only for inspection by Public Health Authorities, they do not alert store managers to problems, nor do they notify staff on tasks to follow food safety regulations – such as the manual inspection of refrigeration units thrice daily.

In contrast, modern IoT technology offers sensors that not only do the loggers' job, but also record and transmit live data in one-minute, five-minute, or 15-minute intervals. The result is a system that not only complies with food safety regulations but alerts store managers immediately if a refrigerator's temperature strays from its optimal zone.



Above: [Westfield](#)
[World Trade Center, New York](#)
Photographer: [Jessica Gonzalez](#)

The ROI In IoT

As the grocery retail sector is estimated to account for 2% of the electricity used globally, IoT solutions have been proven to account for a 40% reduction in food loss through temperature monitoring and a 30% of total net energy savings via peak load optimization and reducing overall consumption (World Economic Forum, 2021).

Retailers can today meet sustainability targets while unlocking cost efficiencies – all while powering new experiences that meet the consumer expectations of tomorrow. Matching the right technology choices with each specific use case allows for accelerated time-to-value in a manner that grants rapid exploration and experimentation – all with a clear focus on ROI.

Resiliency, sustainability, and efficiency are necessary parts of delivering the retail experiences that customers want. Software plays a key role in unlocking data to generate rules, trigger actions, and aggregate insights that match operational KPIs and objectives. Global system integrators like Avanade bring the unique ability to combine strategy, innovation, and flexibility alongside industry expertise and deep Microsoft technical excellence, to empower retailers to do what matters.

Because in the end, you don't need to prove the technology. You need to find real problems and prove that fixing them will lead to an ROI. And that's something that we've worked hard to produce.



A snapshot of tech for corporate ESG goals

Laura Fuentes-Dominguez, Senior Manager, Intelligent & Digital Workplace at Accenture



Laura Fuentes-Dominguez summarizes tech-enabled workplaces for effective ESG reporting to start a journey of continuous improvement towards sustainability.

ESG is on the agenda of most major corporate boards and many view technology as a tool to report and measure progress. This is especially true when considering sustainability, where technology can enable companies to achieve their goals, often diving into fields that have been overlooked in the past.

Corporate Real Estate is, for many organizations, an area with untapped potential for improvement. From design and construction to ongoing operations of new and existing facilities, technology can empower organizations and accelerate progress to reach ESG goals in many ways.

- **Technology can provide insights to improve operational efficiency.** For instance, we can find opportunities to adjust lighting and HVAC operations schedules based on data

like typical building occupancy or outside temperatures.

- **Technology can automate tasks and adapt in real-time.** Smart buildings can reduce energy consumption by lowering utilities usage. As an example, you can leverage automated window shades to optimize natural light in winter and minimize solar gain in summer.
- **Technology can identify trends and model the future.** Machine learning can identify correlations between often disparate events. This results in data-driven decisions that are constantly evolving, like optimizing when to start cooling or heating spaces based on employees' arrival and departure times.
- **Technology can measure our footprint.** Using sensors and smart components, workplaces can quantify outcomes such as disposal of landfill waste vs. recycling, reduction of water bottles with the use of water fountains, and — perhaps one

of the most critical factors of our carbon footprint — how, when, and where power is consumed.

- **Technology can inspire and accelerate our success through accountability.** It's critical that organizations see tangible progress towards sustainability goals and make everyone part of the journey. Technology can help get people involved – transparently sharing data with employees on how their specific sites perform and showing them how their seemingly small decisions are making a difference as they become part of a collective effort for change.

The best approach is to help clients design their future workspaces, taking these points into consideration. Intelligent workplaces not only enhance the employee experience in the physical workplace but can start a journey of continuous improvement towards sustainability.



Smart sustainability depends on digital

Miranda Hill, Innovation and Sustainability Lead at Avanade



As Innovation and Sustainability Lead at Avanade, Miranda Hill knows how to activate sustainability through digital. Here's her practical sustainability framework that works across any organization.

As Innovation and Sustainability Lead at Avanade, Miranda Hill knows how to activate sustainability through digital. Here's her practical sustainability framework that works across any organization. Understanding and navigating the blockers can be straightforward with the right blueprint, so let's dive into some strategies to get the ball rolling.

The importance of short-burst innovation cycles

The usual pattern is to make bold statements... but then what? Too often, that's followed by slow progress and action. Especially because sustainability ambitions are often articulated as a bold moonshot, making it hard to break them down into parts and consider the next best action to take. That's why it's good for companies to consider sustainability through the lens of what can be done in the short, medium, and long terms and to compartment-

talize investments into bite-sized experiments that help them make progress in achievable steps.

Knowing where you are on the sustainability maturity curve

As a starting point, companies must be realistic with their level of maturity on sustainability work; are they at a point where they are just starting to report on sustainability? Or are they already doing the reporting, but need to take more aggressive steps to lower GHG emissions in operations, or in the supply chain? Wherever companies are on the spectrum, digital can play a role.

Breaking it down into parts

How do you map sustainability ambitions to real results? Consider some of these questions:

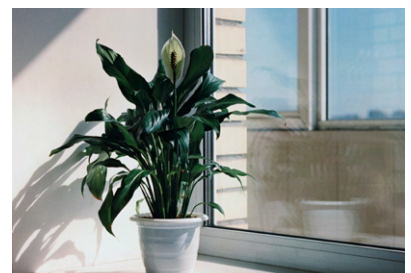
- How can I report more efficiently on my company's GHG footprint and help with its emissions reduction progress?
- What tools and techniques are available to measure the impact of my IT assets and offset their carbon emissions?

- How can I monitor and lower GHG emissions so that my company can meet regulatory standards?
- How can I reduce the cost to operate across my physical footprint?

If you break down what needs to be done to address these questions, you realize it comes down to:

- Streamlining recording and reporting requirements
- Baseline and continuously monitoring carbon intensity in your IT estate
- Helping to provide the insights and capabilities to take real action that increases transparency, lowers risk, and increases operational efficiency

In all of these scenarios, digital can help.





Here are three propositions that help you to drive tangible results on all three fronts.

Job to be done	Record and report efficiently so that you can share sustainability progress more seamlessly with stakeholders	Baseline and continuously monitor carbon intensity in your IT estate	Take action through the mix of the right digital technologies to increase worker safety, lower risk, lower emissions, optimize energy, etc.
	You can't manage what you can't measure. Get your data in order to report sustainability outcomes more efficiently to regulators and other stakeholders – efficiently and consistently.	Baseline your energy use and carbon footprint across your tech stack to continuously optimize impact across your tech investments. An energy efficiency story helps you win on sustainability.	Invest in the right digital capabilities to make better decisions on operational efficiency, supplier transparency, and emissions across your operations. Leverage those insights to build on new business models.

A practical call to action

If there's one primary call to action here, it's to be practical about sustainability actions, folding them into your digital transformation – a sustainability hack, of sorts. What do we mean by that? Turn your cloud modernization project into an energy optimization opportunity. In doing so, you will impact your carbon intensity across your tech estate. Leverage predictive maintenance capabilities to detect

pipeline leaks in the field to increase workplace (and community) safety and avoid PR headaches. Monitor the environment and calibrate environmental systems based on capacity to optimize energy use, and you'll lower your carbon footprint – you get the picture.

Whether you are just at the beginning, or further along in your journey, there's more you can do to take sustainability action and drive results that hit your

bottom line: cost savings, energy reduction, service optimization, risk mitigation, and more. If you challenge yourself to mine sustainability benefits from the work you are already committed to doing, you can drive toward your longer-term goals through transformational 'hedges' that provide proof of value in the near term. In doing so, sustainability is part of a longer-term process, not an endpoint.



The sustainably healthy building paradox

Francesca Brady, CEO and co-founder at AirRated

AirRated

Francesca is CEO and co-founder at AirRated; the global benchmark for indoor air quality. Since formally launching at the start of 2020, the AirRated portfolio has over 10M sq.ft. of Real Estate in the UK and continental Europe. Francesca is dedicated to promoting and educating audiences from the property industry about the importance, benefits and management of good indoor air quality. In 2021 she was honored on the Forbes 30 under 30 list for her work with AirRated.

There's no denying that our commercial spaces need to be more sustainable, but at what cost? Awareness of the ongoing climate crisis and its impact on our day to day lives is increasingly tangible as we see bills rise, and social disruption and increasing political pressure being mounted on governments and decision makers.

Whilst this sits high on the agenda within CRE, as it should be, one of the big challenges is how we balance sustainability with other important aspects of our commercial spaces such as efficiency and productivity as well as health and wellbeing.

AirRated's most recent survey of employees and CRE decision makers in the UK and US found that 73% had an increased awareness of indoor air quality (IAQ) from 2021 to 2022 (a rise of 20% on the previous year), with 80% expressing an understanding of IAQ's impact on their health and 68% saying that a lack of transparency about how healthy a company's office would influence their decision to work there.

So where do we go from here? It's clear there's demand from both sides of the fence to solve the conflict, but what's been halting progress?

How have we got here?

Over recent years regulation and commercial focus has predominantly been around sustainability and the push towards net zero. The outcome of this is that we've looked to develop or retrofit buildings to make them more sustainable, which isn't a bad thing at all, but has led to regulations and mandatory requirements to be put in place that can inadvertently, negatively impact the health of buildings.

A good parallel example to relate to is around car emissions. There was

a big push to move from petrol to diesel cars due to the impact petrol emissions had on our environment, however diesel cars produce NOx gasses, which are particularly harmful to humans. Even though our intentions can be to protect the planet, this can sometimes come at a cost to human health and vice versa.

But why does this happen? Well, there can be an argument towards the fact that we prioritize dealing with issues that we perceive to be directly impacting us in the physical sense. We've seen this with climate change over the recent past where maybe we were less aware of the impacts our behavior had on our environment and didn't notice the subtle indirect consequences over time until we saw big events that either caused disruption to us directly or became almost impossible to ignore. For example rising temperatures, flooding, forest fires and other incidents that have made mainstream media.

To make headway against these targets there has been an introduction of stricter regulations when it comes to building sustainability within CRE. One recent example is the upcoming requirements around



sector are driving demand for health buildings and will pay premiums of 4.4-7% to secure a “healthy building”. With the Lawrence Berkeley National Laboratory estimating that improving air quality can add up to \$20 billion annually to the US economy, that doesn’t seem like a bad trade-off either.

The message is that we can’t continue to bury our heads in the sand when it comes to healthy buildings – there’s demand and it’s only going to grow in importance over time. But it’s also clear that effective buildings have to balance both being healthy and sustainable and it shouldn’t be an “either-or” conversation.

MIT’s School of Architecture and Planning reported that lighting, thermal comfort and air quality were the top three features of a healthy building prioritized by stakeholders, yet despite the reported benefits of meeting these demands, building owners still struggled implementing healthy buildings due to budget, prioritization of energy performance, unclear business cases and a lack of expertise. These types of challenges need to be addressed if we’re to strike the right balance.



EPC ratings. From April 1 2023, both new and existing commercial lettings must have a minimum EPC rating of E, with landlords not able to continue with an existing tenancy under that rating. This increases to C from 2027 and B from 2030 with substantial fines issued to those that don’t meet requirements. These regulations aren’t necessarily helping make our buildings healthier though and can lead to more airtight buildings and unhealthy characteristics within our indoor environments, especially if the building’s design and specification was more focussed on ensuring sustainability over IAQ for example.

In response to this there has been a much bigger emphasis on sustainability within CRE. The property sector creates approximately one-third of global greenhouse gas emissions, and 40% of global energy consumption and in order to meet the commitments made in the Paris Climate Agreement. The global average building energy intensity per unit of floor area needs to be at least 30% lower in 2030 than its current level (source: UNEP Finance Initiative’s Global ESG Real Estate Investment Survey Results, 2019).

We’re starting to see increased awareness and focus when it comes

to air quality and healthy spaces though in the aftermath of the COVID-19 pandemic, as the impacts of air quality and healthy buildings become more apparent in our day to day lives. Initiatives such as The Future Building standard, which includes the new Part F regulations and requirements to undertake continuous CO₂ monitoring within certain buildings are all recent examples of regulatory changes aimed at making our buildings healthier.

The rise of healthy buildings

It’s clear that healthy buildings are starting to become a higher priority for Real Estate investors as well as occupiers. The Global Wellness Institute estimates that the number of buildings worldwide which have earned wellness building certifications has grown over 1,000% over the past year, maintaining a 200% yearly growth over that period. This coincides with 92% of Real Estate investors expecting demand for healthy buildings to grow over the next three years.

The demand from the top isn’t unjustified either. 87% of investors stated that tenants from the office

How can health and sustainability live in harmony?

Going forwards, we need to focus on creating spaces that are healthier for us and better for the planet – doing so is absolutely key in order to build a more resilient future for us all.

The quality of a building's indoor environment can significantly impact our physical and mental health, wellbeing and productivity. There are multiple factors that contribute to making indoor spaces healthy, and it is essential to consider the entire life-cycle of a building – from design and construction, to operation and maintenance.

Whilst it's easier to tackle this issue when considered from the design stage, 80% of office buildings which exist today will still be in-use in 2050 so how can we optimize our existing buildings?

Understand your building's current performance

Whilst it may seem a daunting task to make our spaces healthier, understanding how your buildings are currently performing is really important to establishing a pathway to creating healthier, more effective indoor environments.

By collecting real time data on your indoor environment, for example with IAQ sensors, and your building operations via a building management system (BMS), you can start to better understand how your building is performing and the relationship between sustainability and health. This allows you to identify areas of strength or weakness across your space as well as helping you start to test and optimize your specification to find the right balance between the two.



Left:
[Brookfield Place Mall](#),
[New York City](#)
Photographer: [Jessica Gonzalez](#)

Right:
[New York City](#)
Photographer: [Jessica Gonzalez](#)



Set suitable targets

It can be helpful to set some thresholds to aim for in creating a healthy space – your buildings don't have to be performing perfectly to be considered healthy. If you understand how the different parameters of air quality impact health, you can make more considered decisions as to how best mitigate those risks whilst remaining sustainable too. If you're not sure what to aim for, this is where getting some support from experts or certification bodies can be really useful.

Test and experiment

To achieve sustainability in healthy buildings it's all about working out how much energy you're using and the performance of your internal environment right now. It's then working out your ideals and establishing how you get there. We see a lot of occupiers leaning on property managers and facilities managers to say, "This is what we're working with right now. If we wanted to make our space more sustainable, how would we go about doing that?". Then if you were to make changes, you could monitor what the internal environment was looking like, what the energy

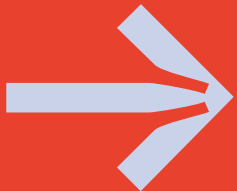
consumption was looking like and identify what works and doesn't. It will be different for different spaces based on lots of different factors, but sometimes even simple changes such as switching out cleaning products, leaving meeting room doors open in between use, using low-VOC materials and even optimizing your ventilation systems to be used in line with demand can contribute to making your spaces healthier without compromising on sustainability.

In summary

Ultimately, creating sustainable and healthy buildings is possible and it needs to become the norm. Both health and sustainability have huge importance within CRE and will play a big part in future buildings as the demand for better buildings increases not just from investors but from our people and planet too.

Deep

Dives

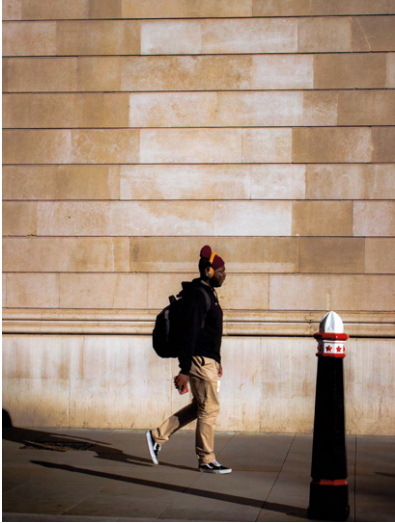


When it comes to buildings, there are some of us who just need to know it's all working fine – but there are also those of us who want (or more likely, need) to get into the finer details of how it works.

The same can be said for smart building technology; some of us only need to bother ourselves about the outcomes and what the technology can enable us to do. But some of us want to know exactly how it works – and why.



New York City
Photographer:
Jessica Gonzalez



Well, for those of you who are into all those finer details, check out our sections:

Contents:

Internet of Things (IoT)	148
The story of the first IoT device	149
IoT and indoor air quality: How commercial IAQ monitors use IoT technology	154
Laura Lian, CMO at Kaiterra	
How can digital twins unlock new possibilities?	158
Danny Stubbings, Vice President, Technology, Data & Analytics at Oxford Properties	
Uncovering the most common cyber security threats	161
Lewis Bramfitt, CEO at Bramfitt Technology Labs	
Buildings can do much more to reduce their cyber security risk	164
James McHale, CEO at Memoori	
Eliminating building waste with tech	166
Josh Eadie, CTO and Founder at measurable.energy	

Above:
[Bank, London, UK](#)
Photographer: Jamie Kettle

Deep dive:

Internet of Things (IoT)



The ‘things’ in the ‘Internet of Things’ (i.e. hardware such as sensors or other devices) are often supported by an IoT ‘platform’.

While a fairly generic term, IoT platforms help make sense of the data generated by the sensors and sent over the network.

IoT platforms can do any, or a combination of all, of the following:

- Act as a device/hardware management tool
- Data collection, aggregation, and processing
- Visualization and monitoring

But how does this IoT technology work? How is the data sent and received by an IoT platform? How did it come to be? Let's take a closer look.

The story of the first IoT device

It may not be surprising to find out that the first true IoT device was born from frustrated graduate students not getting what they wanted when they wanted it. In this case, the students were at Carnegie Mellon University in the early 1980s, and all they wanted was an ice-cold Coca-Cola.

As the story goes, David Nicholls, graduate student, was working away in his office when he suddenly got a craving for a Coke. The only problem? His office was

‘relatively far’ from the nearest vending machine, and he was pretty sure once he trekked over there he’d face one of two situations: the vending machine would either be empty or only recently refilled, leaving him with a warm and deeply unsatisfying drink.

“Suddenly, I remembered tales of the Prancing Pony [the first computer-controlled vending machine] at Stanford and realized that we didn’t have to put up with this, that we had the technology,” he later recalled.

The IoT Avengers assembled: together with Mike Kazar and Ivor Durham, fellow graduate students, and John Zsarnay, a research engineer, Nichols put his mind to this tricky, but ultimately solvable problem.

The key lay in the vending machine’s light system. There were six lights, each corresponding with one of the six columns of Coke bottles. When a bottle left the vending machine, that column’s light would flash momentarily before turning off again. When the column was empty of bottles, the light would stay on until they were replaced.

Zsarnay, the team’s resident research engineer, installed a sensor board into the vending machine to track the lights, which connected to the ARPANET (the Advanced Research Projects Agency Network, a technical foundation of the internet we

know and love). We may have made this sound straightforward, but in reality it was anything but: the very first version of the board actually caught fire when it was installed into the Coke machine!

The program Kazar concocted was, he says, pretty simple: it checked the status of each column’s light every few seconds, knowing that an on/off flashing light meant a drink had been bought, and that if the light stayed on then the column was empty. The machine always held two cold drinks in backup, so when the light went back off the team knew that those two cold ones were ready while the rest were warm. How did they know when they were chilled and ready? Three hours after restocking, the program showed those bottles as ‘cold’.

And thus was born the first IoT device. The team didn’t just keep this to themselves – the altruistic scientists set the system up so that anyone with access to the ARPANET or Carnegie Mellon’s local Ethernet could keep track of the Coke situation and get themselves an ice-cold beverage, no wasted trips in sight.

Fun fact: after all that, it turns out Mike Kazar never even liked Coke! ‘It’s way too sweet,’ he told us, ‘I just did it as a favor to Nichols’. Sounds like we could all do with a friend like Mike Kazar to help us realize our dreams.



Types of connectivity protocols

The essential connectivity technologies behind sending and receiving IoT data can be broken up into two main categories:

1.

IoT data protocols

allow information to be exchanged between sensors or devices (without the need for network connectivity)

These protocols are modes of communication that ensure optimum security of the data being exchanged between the devices and/or platform.

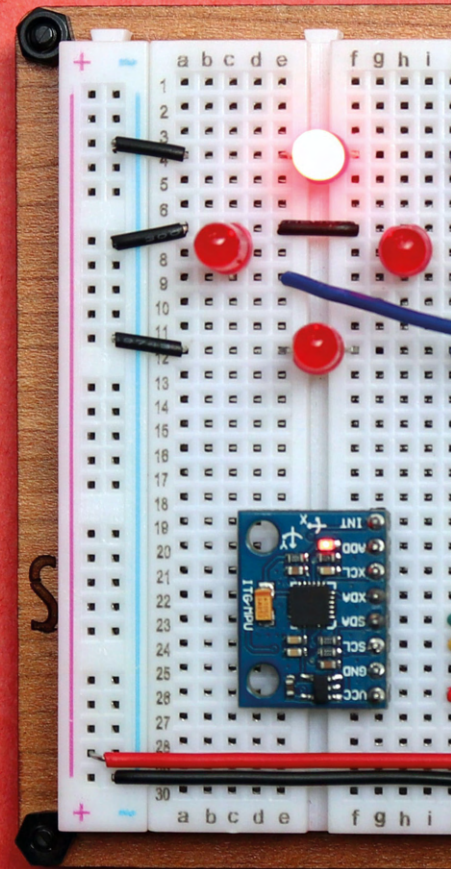
2.

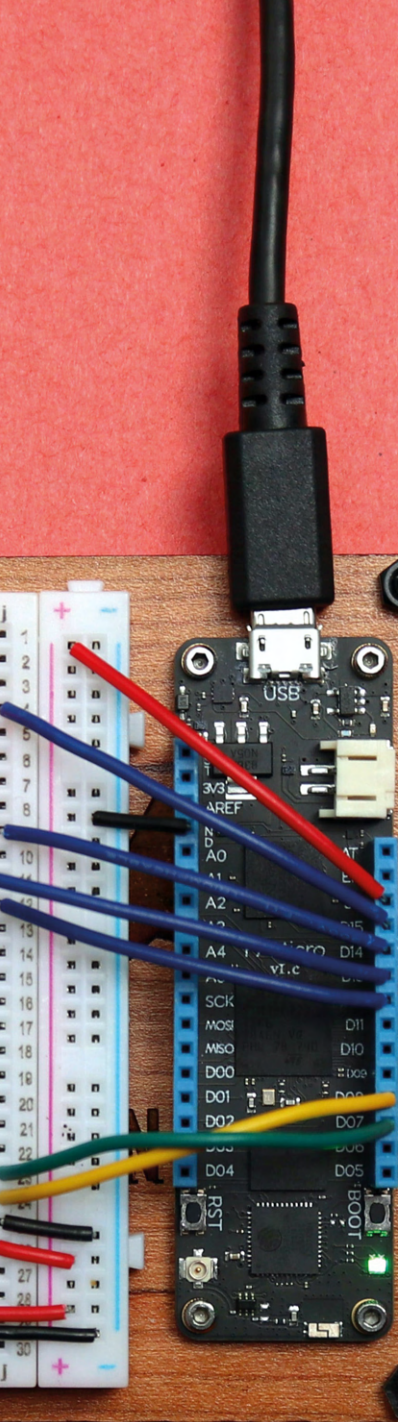
IoT network protocols

allow devices to connect to one another and to the IoT cloud platform (which requires network connectivity)

IoT data protocols

IoT data protocols enable low-power IoT devices (which are essential for preserving battery life) to exchange data with one another.





The main IoT data protocols include:

Message Queue Telemetry Transport (MQTT)

restricted for low bandwidth networks and high-latency IoT devices (i.e. sensors which take a long time to travel from a client device to a website server and come back). It provides support for Quality of Service (QoS), and devices send data to a 'broker service', which is subscribed to for data

HyperText Transfer Protocol (HTTP)

this protocol has formed the foundation of data communication over the web and is the most common protocol that is used for IoT devices. However, constraints include its cost and battery life

WebSocket

allows web applications to conduct two-way communications with web servers, given HTTP is unable to do this without awkward workarounds

And a few less-common IoT data protocols include:

- **Constrained Application Protocol (CoAP)**
a specialized internet application protocol to enable constrained devices (i.e. small devices with limited

CPU, memory, and power resources) to join constrained networks (i.e. which have low bandwidth and availability)

- **Data Distribution Service (DDS)**
a protocol developed for machine-to-machine (M2M) communication, which enables data exchange via publish-subscribe methodology (which is used in serverless and microservices architecture)
- **Advanced Message Queue Protocol (AMQP)**
an open standard application layer protocol for message orientation, queuing, and routing
- **Extensible Messaging and Presence Protocol (XMPP)**
is an open communication protocol that is designed for instant messaging (IM). It supports this by the exchange of Extensible Markup Language (XML) data over the network
- **OPC Unified Architecture (OPC UA)**
an M2M communication protocol used for industrial automation, developed by the OPC Foundation. This is independent of the manufacturers and system suppliers of the application

IoT network protocols

IoT network protocols connect sensors and devices to one another and with IoT cloud platforms, over a network. Each protocol transmits data via a different method.

The main IoT network protocols include:

1. Cellular –

current cellular infrastructure can be used to extend the communications capabilities of IoT devices, adequate for low power and high data rate applications

2. Bluetooth –

a widely used protocol for short-range communication and the standard protocol for wireless data transmission. This protocol operates at a 2.4GHz ISM band, whereby the data is split into packets before sending (IoT Design Pro, 2019). In addition to Bluetooth, Bluetooth Low Energy (BLE) consumes lower power and therefore preserves battery life better than standard Bluetooth

3. WiFi –

is the most popular of the IoT protocols for wireless local area networks (WLAN). It utilizes the IEEE 802 standards through 2.4 GHz (large range, lower speed) and 5 GHz (low range, high speed) frequencies. These standards could allow vendors to create a secure mesh between sensors and gateways

4. LoRaWAN –

Long Range Wide Area – low power usage, less frequent updates, but a very long range protocol designed for battery-powered systems (de Mendizábal, 2022). The main advantage of LoRa technology is its use of the ISM operating band: 868 MHz, 915 MHz, and 923 MHz. These frequencies are much lower than the popular 2.4 and 5 GHz, resulting in fewer transmission losses and much better penetration through obstacles such as building walls

Benefits of IoT for your organization

Now that you understand a bit more about how IoT works, let's explore some of the main benefits of IoT for your organization:

- Real-time collection of data for intelligent decision-making
- Automated data analysis and rapid reaction
- Cost-effective solution
- Monitoring occupancy and space utilization in your building
- Measuring indoor air quality and comfort levels

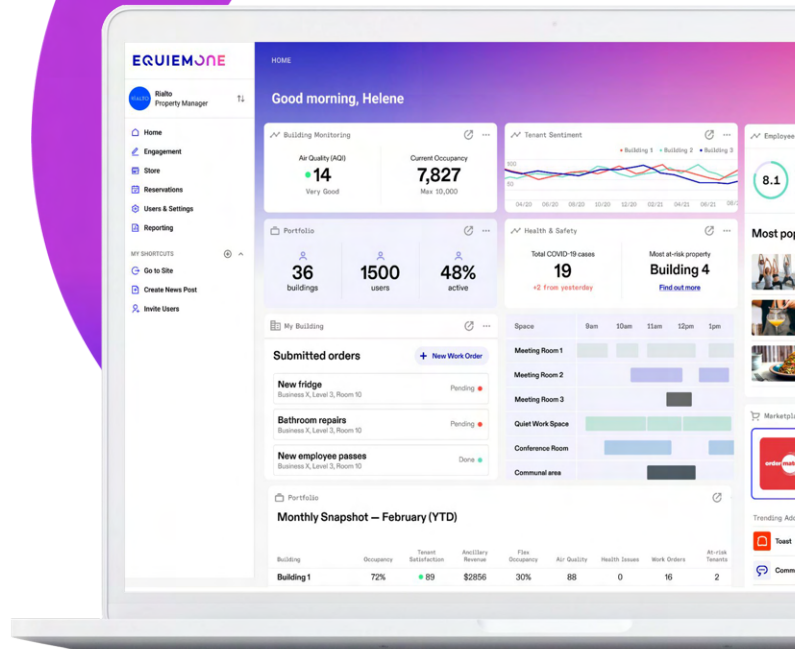
Hopefully, now IoT feels less like a buzzword, and more like something tangible that could make a difference to you, your building, and your people.



EQUIEM

Make your workplace work for you

Tenant Experience, Building Operations and Analytics in one, easy-to-understand building platform.



✓ Tenant Experience

Streamline and personalise every part of the workplace experience process and create a community that tenants truly value.

✓ Building Operations

Control all your facility operations in Equiem's backend – from access control and flex space to eCommerce.

✓ Analytics

Truly understand your tenants' wants and needs. Use solid intelligence to create grounded, intentional strategies that are destined to succeed.

EVALUATE YOUR WORKPLACE EXPERIENCE

Book a free demo today
getequiem.com





IoT and indoor air quality: how commercial IAQ monitors use IoT technology

Laura Lian, CMO at Kaiterra



Laura is the CMO of Kaiterra, an award-winning and industry-leading indoor air quality (IAQ) and management organization. An IAQ enthusiast and sustainability advocate, Laura frequently writes about IAQ, healthy buildings, and ESG.

The Internet of Things (IoT) describes a network of physical devices, connected to the internet and exchanging data. Internet-enabled tech has become ubiquitous in our daily lives – from our phones to our cars and even our household appliances.

Most types of commercial indoor air quality (IAQ) monitors currently on the market are IoT-enabled. Connectivity makes it possible to send air quality data to the cloud where it can be stored, processed, and accessed by apps. Building staff can access IAQ readings remotely, identify areas that suffer from poor air quality, or share information with occupants.

More advanced use cases of IoT in air quality monitoring go beyond sharing or accessing data. The true challenge is enabling automation to optimize building operations. Connectivity

with building management systems provides new opportunities to improve air quality. IAQ measurements can programmatically trigger changes in other systems – such as HVAC – to optimize indoor environments for comfort and energy efficiency, with solutions such as demand-controlled ventilation (DCV).

It's healthier and more energy efficient to use occupancy and air quality as the HVAC control signal, rather than a simple temperature setting. IoT sensors make it easier to collect and monitor data in more places, ensuring every part of a building is optimized for human comfort while reducing wasted energy – we no longer have to heat and cool unoccupied areas.

What to look for in an IoT-enabled air quality monitor

Is your indoor air quality (IAQ) monitor leveraging the full possibilities of IoT technology?

Check for the following:

1. Integration with existing Building Management Systems (BMS)

Are you looking to use IAQ data as part of a building automation system? You should choose a device that natively integrates with your existing tech stack.

Native integrations can reduce the need to create custom API connections and help get your system up and running quickly. Check if there is clear and detailed information about which BMS is supported 'out of the box'.

Otherwise, you might find yourself with unplanned engineering overhead of developing custom connections. The effort here could be substantial, increasing the overall costs of your project.

2. Support for building communication protocols

Over the years, standardized communication protocols have emerged to enable different business systems to 'speak' to one another effectively. This is important when you want to introduce new systems or customize your existing deployment. It's also a way to future-proof your implementation in case components need to be replaced at some point in the future.

Check that your devices robustly support the most widely used building communication protocols, including BACnet and Modbus. Some vendors claim they support these protocols but do so in a way that's clunky, poorly documented, or difficult to implement. Check for case studies or proof of cases where the system has successfully been integrated using these protocols. Third-party certification can also validate such claims.

3. Security features

Security is a top priority when implementing any IoT system. You want to prevent unauthorized access to confidential information via the connected system. This is especially important as IoT devices have been used in many recent cyber attacks.

Here are some elements to look out for:

- **TLS/SSL encryption:** ensures that only authorized devices can connect to the network
- **Single sign-on (SSO):**

authenticates users who log into the software side of your IAQ monitoring tool, via your identity management provider

- **Two-factor authentication (2FA):** adds an extra layer of security by requiring both something you know (your password) and something you have (your phone) to log in
- **WPA2 Enterprise/802.1X:** requires users to enter an additional password before they can access wireless networks or resources on them

You should also check that security is routinely validated by third-party penetration testing.

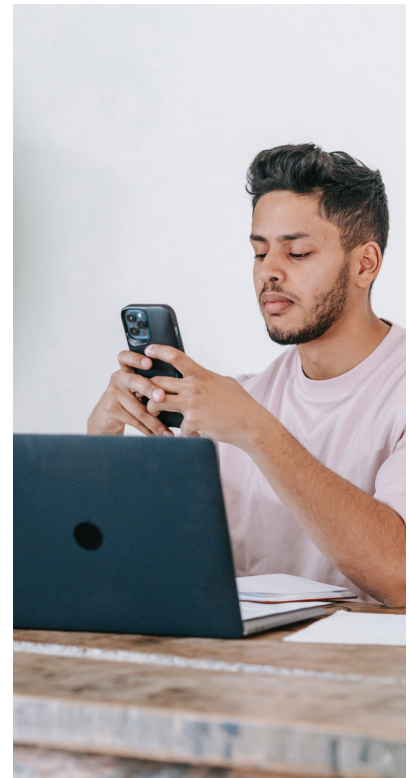
4. API-first design

An API is a set of functions, protocols, and tools for software applications. Think of it as a two-sided cable that enables you to connect your devices to other software systems and applications.

An API-first approach means that the IAQ monitoring system is built with an open API at its core. This allows developers to build applications that interact with the data the air quality sensors collect. Data can power additional business apps, web portals, or building management systems.

For a simple example, you might want to send a Slack notification when the air quality drops below a certain level. Or, you might create custom alerts based on specific thermal comfort parameters such as temperature or humidity. An API-first design will make these customizations much easier to implement.

IoT technology is changing the way organizations are monitoring air quality, ensuring a measurable built environment with a connected network of devices. Keeping in mind the four key considerations mentioned above will help you to better evaluate IAQ technology and its integration into your building strategy.



Deep dive:

Digital twins



to buildings (an office, hospital, or any other commercial space), a standardized building model is what brings context to data from IoT sensors and other systems. It opens the doors to much more meaningful and accurate visualizations of building data. For example, the real-time occupancy, humidity, temperature, and CO₂ levels could all be shown via the digital twin of the physical office space.

In this example, IoT sensor data is sent to a software platform where it's then presented with the context of the digital twin, allowing real-time data to be viewed in a purposeful way.

Hence, the digital twin essentially can provide a contextual model of the entire smart building environment. You can then virtually keep an eye on how your building, or whole estate, is performing in relation to this data.

What is a digital twin?

Put simply, a digital twin is a virtual copy, model, or representation of a real-world physical asset, process, or system. It could be a building, a car, or even a rocket (if you really wanted).

The general use cases of a digital twin

A digital twin can either show static data relating to the physical object or, arguably more usefully, could show real-time data and activity corresponding to it.

The virtual representation of the object (i.e. the digital twin), can therefore be used for a variety of practical purposes such as:

- System simulation
- Future modeling
- Integrations
- Testing
- Monitoring
- Maintenance

How digital twins relate to smart buildings

A digital twin can be used as a core component of something bigger. So, thinking back





Let's explore the benefits of digital twins

Hopefully, now you understand what a digital twin is and how it can be used, so let's explore some of the benefits of a digital twin:

- Readily available representation of the physical object
- Easy to maintain an up-to-date version of the physical object
- Can be used as a single source of truth by multiple platforms and systems

Now, why not take a closer look at the benefits of using a digital twin for a smart building specifically:

- More meaningful grouping and aggregation of data give better visibility of your building's performance by breaking down per floor, room, or zone
- Virtually view and analyze real-time data across all spaces within a building
- Drill down into problematic areas of your building during root cause analysis

Quick-fire myth-busting about digital twins:

We've come across a fair few myths when it comes to digital twins within the PropTech industry, so we thought it would be a good idea to debunk the three biggest myths we've seen:

1. Digital twins only apply to buildings

Many people in the PropTech industry seem to think that digital twins only apply to buildings. But that's just not true!

In fact, NASA was the pioneer in what was then known as 'pairing technology'. They used the concept in the early days of space exploration to virtually study and troubleshoot the systems onboard the physical spacecraft.

2. Digital twins need to be really complicated

A big assumption is that digital twins need to be really complicated to be worthwhile. But you can create a very

simple digital record of something, which would technically act as a digital twin.

This very simple version of a digital twin could then help to infer and identify the specific problems and use cases that you want to solve.

3. Every building needs a digital twin

This might initially feel sacrilegious to say in the PropTech world, but not every single smart building needs a digital twin.

For many businesses, creating a digital twin can be an incredibly worthwhile investment of your time and money, but it's important to first understand your priority use cases and then explore how a digital twin could help you achieve this desired outcome.



How can digital twins unlock new possibilities?

Danny Stubbings, Vice President, Technology, Data & Analytics at Oxford Properties



A transformational technology leader specializing in data, operations, engineering, and cloud. Currently building products to support the digital transformation of Real Estate, covering IoT, twins, and advanced analytics.

There's massive hype about digital twins. While they are nothing new in general, they are still a relatively new concept in Real Estate. It's become a loaded term, and I'm certain if you asked five people to describe a digital twin you'd get six different answers.

Why do I even need a digital twin? It's a valid question, and much of what I have seen is fixated on how the data is presented, all the graphs, the charts, and the geospatial modeling. I can see why; it looks good. However, here lies the fundamental problem. You can have a visually stunning user interface, graphs, and charts, but if you can't trust the data that's being presented, it's meaningless. It becomes another failed technology solution. It's exactly this problem that gives technology a bad reputation for over promising and failing to deliver.

Let's take a step back and start with the basics. What is it we are

really looking for? I would suggest the answer is actionable insights that are driven by trusted, reliable data. In order to achieve this we need to know some basic information about a building.

Every OT asset (operations technology asset) needs to be recorded, and for every asset, every single configuration item (CI) needs to be captured. Not only does it need to be recorded, but it also needs to be maintained as poor data quality is the enemy.

There's another debate about what ontology to use. It's maybe a contentious point, but I'll let you into a secret – it doesn't matter. If you're able to populate an ontology, and have a trusted source of data mapping to another, ontology is easy. It would be a nice problem to have.

Once you have collected all of this data you can start to interrogate your building and start to think about how to visualize your data. Who is your audience? A Facilities Manager will have a different set of requirements to a Property Manager or an Asset Manager. However, the beauty of this approach is that once you have

trusted data in a time series, and graphs mapped to an ontology, you are able to recompose the data to suit the needs of the various consumers. It's much less about the visualization and much more about building an independent pluggable data layer.





New York City
Photographer:
Jessica Gonzalez

This is where the value is. The ability to ingest data from the base building, from IoT sensors, from security systems, from tenet BMS systems, from traffic to weather. The list is endless. From here, PM and FMs can ensure that their buildings are in tune – no more heating and cooling at the same time, no more systems in conflict or fans pegged to 100%. Tuning alone will reduce energy consumption, and reduce stress on equipment prolonging its life. It will also transform how maintenance is conducted, with no more routine maintenance for the sake of it.

Over time you will be able to identify leading indicators in the data that will enable you to proactively respond before there is an incident. This

is truly transformative as from a business perspective you can reduce your operating costs, and from an environmental perspective, you can reduce your emissions as you can run your fleets and engineering functions more effectively.

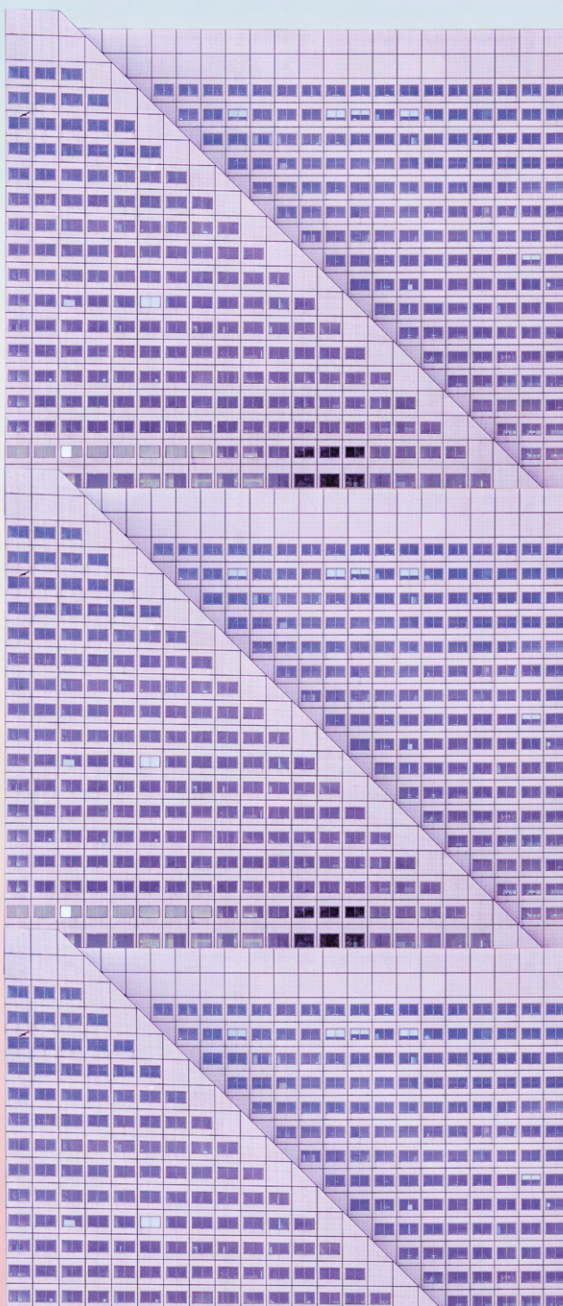
When I think of a digital twin this is what I am thinking about. It's about getting structured data, and everything required to get there. Once you have that you really can unlock new possibilities!

Deep dive:

Cybersecurity for smart buildings

With so many data sources within buildings and the introduction of IoT devices, you'd be forgiven for worrying about the topic of cybersecurity from time to time (or even a lot of the time!) – especially when it comes to your building.

We spoke to two experts to get their take on the main cyber threats for smart buildings and, more importantly, how you can protect your building from these growing threats.





Uncovering the most common cybersecurity threats

*Lewis Bramfitt, CEO at
Bramfitt Technology Labs*



Lewis Bramfitt is CEO at Bramfitt Technology Labs and ex-military with a strong and prestigious career built on his background in application security, secure development operations, financial security, and penetration testing across the FTSE100 landscape industries.

Firstly, can you tell us who Bramfitt is and how you help smart buildings with regard to cybersecurity?

Bramfitt Technology Labs is a security-focused consultancy that specializes in improving the security of clients and their customers. We provide advice and guidance to senior teams in large enterprise organizations as well as technical services such as Cloud Security, the Internet of Things (IoT), Operational Technology (OT), Infrastructure Security, SecDevOps, and Application Security.

In the journey so far, Bramfitt has supported over one hundred clients in around six hundred projects in more than twenty different countries around the

world. This all equates to improving security for millions of people. As society and industry progress, the need to implement security remains constant. However, the methods, technologies, and maturity may vary from sector to sector. As such, Bramfitt provides technical and security expertise to organizations utilizing SMART generation technology when realizing their ambitions.

Okay, let's get into it. What are the main threats you are currently observing in relation to cybersecurity for smart buildings?

Default or insecure passwords

Almost all IoT devices are deployed with a hard-coded password. Hackers look for this low-hanging fruit when attempting to break into devices as default passwords are easily found within device documentation online or even the manufacturer's own website. Last year alone, 61% of all cyber attacks in 2021 were for brute force and credential stuffing attacks, meaning malicious cyber actors were using common



or compromised passwords to try and gain access to internal systems or accounts (Verizon, 2022).

Inconsistent management of password policy throughout an organization is also a threat once the solution is deployed. Only a single device need not adhere to password management policies, for an attacker to compromise the entire corporate network.

Lack of regular security patches

As time moves on and the IoT ecosystem evolves, vulnerabilities will almost always be discovered. Many of these devices will never have these security issues patched or an

update released to fix these issues, allowing hackers to exploit known vulnerabilities. This became evident in 2017 when the Satori malware infected thousands of wireless routers in a day. The infected devices that had known security vulnerabilities that were years old. 57% of cyber attack victims report that their breaches could have been prevented by installing an available patch and even more chilling, 34% of those victims knew of the vulnerability but hadn't taken action (Kent, 2018).

Insecure data storage and transfer methods

As more devices are added to an IoT network, the communication between these devices and systems multiplies drastically. With larger amounts of data stored and transmitted, comes the threat of an attacker intercepting or stealing confidential information. It is therefore necessary to ensure that data is properly encrypted with modern standards both at rest and in transit across the network to prevent malicious actors from compromising these streams. A Kaspersky report found that more than 872 million IoT cyber attacks (58%) used the telnet protocol with the intent of cryptocurrency mining, distributed denial-of-service (DDoS) shutdowns, or stealing confidential data (Kaspersky, 2021).

Lack of physical hardening

Since most IoT devices are deployed in a remote location it becomes more difficult to secure devices as they are constantly exposed, for example, a hacker could access a remote device and physically remove storage components that hold sensitive data, such as onboard external storage. This physical access also allows the attacker exploitation of insecure interfaces built into the device.

A number of IoT devices also leave debug and update ports open and unsecured to make it easier for engineers to update and work on these devices, which unfortunately also makes it easier for malicious third parties to compromise devices as well.

And how does the adoption of IoT increase the threats of cybersecurity?

The introduction of IoT has allowed businesses to collect and process vast amounts of data that will contribute to financial savings and business resilience. By aggregating data from smart devices such as doors, cameras, heating systems, VoIP systems etc, companies scale back their operations and cut energy usage based on how many people are in the building, and increase physical security autonomously with Big Data Analytics.

This has been made more necessary during the last three years of the pandemic and energy crisis. The first half of 2021 saw 1.5 billion attacks on smart devices, with attackers looking to steal sensitive data or build botnets (Seals, 2021); these types of attacks may even reach corporate assets from a device connected to a home network where remote work occurs.

However, a greater number of IoT devices will add complexity to the IoT ecosystem and therefore increase the range of vulnerabilities from the remote edge devices up to the cloud. Rushing to implement modern technologies for business savings will often also mean the more basic security measures are not in place.

Due to the vulnerabilities that often occur in newly deployed IoT infrastructure and the current trend of convergence between the IoT, OT,

and IT domains, hackers may be able to pivot through insecure IoT deployments and into other domains. This not only gives the hackers more access to internal networks, but also allows them to potentially add more devices to their compromise matrix.

An example of this is IoT botnets, such as the Mirai botnet in 2016. A botnet is a large, illegally networked group of private internet-facing devices infected with malicious software without the user's knowledge. In the instance of Mirai, common vulnerabilities and common administrator usernames and passwords had allowed the owners of the botnet to amass millions of routers, smart devices, and other internet-facing IoT technologies.

Hackers looking to create a botnet find the devices in the IoT ecosystem an attractive target because of the weak security controls and the scale of device implementation that can be conscripted into a malicious botnet. To combat this, organizations must understand and follow basic cybersecurity 'maxims', such as good authentication practices, regular patches, and performing testing to ensure that devices meet security requirements before engineers add them to the system.

Why is it so important to protect your smart building from cyber threats?

The Product Security and Telecommunications Infrastructure (PSTI) Bill will be applied to the entire IoT industry, including manufacturers and importers of foreign-manufactured devices. This bill is to protect end users from products that are delivered to the market if they do not meet the required industry security standards.

New legislation is currently being drafted that will have the power to enforce fines of up to ten million pounds on non-compliant solutions. For UK companies, this means an impact to supply chain processes. Currently, most of the present-day IoT devices are imported, putting pressure on distributors, retailers, and importation businesses to ensure their suppliers meet the criteria of this new legislation.

How can organizations protect their IoT assets with cybersecurity? What support is out there?

In many cases a security-conscious, educated user is the best basic defense. By following the advice set out by such organizations as NCSC or IASME which output regular updates on security recommendations, businesses can formulate security policies for their users and systems.

There is also a wealth of information that is freely available online from credible sources such as The Internet of Things Security Foundation (IoTSF) and the UK Government web

What advice would you give organizations that maybe don't have an in-house Infosec team but are looking to adopt IoT?

A few basic security checks will allow the average company protection from many of the potential threats their IoT system may face:

Configure your gateway securely

The default account passwords and names of routers should be changed to avoid hackers gaining trivial access to key infrastructure components.

Use an enterprise-grade firewall

A Firewall or Web Application Firewall (WAF) can be used to detect and mitigate malicious traffic going to IoT endpoints. Whitelisting and geolocation policies can also be employed to only allow authorized users to interact with the endpoints.

Create dedicated wireless networks

Most modern routers allow the creation of multiple wireless networks. Assigning a network solely for IoT devices can limit a breach to the segregated network, preventing further compromise.

Use encryption in transit and at rest

As mentioned previously, encrypted communications are vital to securing any digital infrastructure, not just IoT. IoT communications need to be secured using strong asymmetric encryption standards such as RSA or AES, and these certificates need to be changed at least once every two years.

Use strong passwords/enforce password policy

Many IoT devices will require separate accounts to be set up each with a password. It is important to ensure each of these is unique to avoid one breach compromising all. Password managers are useful in this regard if certificates or secure key stores cannot be implemented.

Enable multi-factor authentication

This is an added layer of security used in concert with simple passwords. With multi-factor authentication, every time the IoT device or account is accessed This additional security step via a business device ensures that even if the credentials are compromised, access is not guaranteed.

Disable unused features

Almost all IoT systems are packed with features to allow the greatest utility to users, but these features can be risky if kept open. For example, if a device is only used when in the home, remote access would not be required.

Keep devices up to date

Many updates do not happen automatically and contain critical security patches. It is worth checking for updates regularly or applying them automatically.





Buildings can do much more to reduce their cybersecurity risk

James McHale, CEO at Memoori



James is CEO at Memoori, an independent analyst company focused entirely on the smart building industry. Memoori delivers unrivaled research with deep domain knowledge of smart building technologies and their implementation.

The ultimate vision of mass hyper-connected smart buildings hosting hundreds of interconnected devices will not be possible without addressing a wide range of building-specific cybersecurity issues. Each system, device, router, server, and gateway, including their multiple versions and iterations, introduces its own cybersecurity risk to the building. And, without strict segmentation, unauthorized access to any one of this broad range of vulnerabilities could expose the entire network.

Buildings were not designed to evolve at this speed and new smart buildings will have to learn about cybersecurity quickly.

"The smart buildings industry remains largely behind the curve in its understanding of the increasingly large attack surface that their systems represent. Facilities management

teams generally still often lack the IT skills required to manage cybersecurity, poorly secured IoT devices still flood the market at attractive prices, and technology continues to increase in buildings despite cybersecurity concerns," explains our research, *Cybersecurity in Smart Commercial Buildings 2022 to 2027*. "A holistic, multi-disciplinary defense approach will be required for each of the different elements that make up the smart building ecosystem to effectively mitigate the cyber threat."

Building technology's historical lack of focus on cybersecurity is best symbolized by previous iterations of open communication standards used for building automation.

The likes of BACnet, LonWorks, and KNX used to lack basic encryption, authentication, or integrity protection features as they were all designed to operate as part of closed networks. This situation has of course now been addressed with, for example, BACnet/SC.

Modern IoT and building automation-devices have also quickly gained a reputation for vulnerability to issues like injection and memory corruption



"Due to the extended life cycles of many smart building solutions, the industry still has a considerable installed base of these legacy building automation systems and devices that remain riddled with security flaws and configuration issues,"

reads our cybersecurity study.

"Legacy systems clearly pose significant cyber risks to building operations, sophisticated attackers are aware of the gaps in security created by legacy systems and are becoming more active in taking advantage of known vulnerabilities to disrupt operations and steal sensitive data."

due to poor coding practices which allow attackers to bypass their security features and gain full control of them.

In addition, too many connected devices still ship with default usernames and password settings. Then, users also often fail to regularly change passwords, use the same passwords for multiple systems or choose simple easy-to-guess passwords. Many newer IoT devices are also being shipped with default settings that communicate over unencrypted protocols, opening them up to traffic sniffing and tampering of sensitive information.

“It should be noted that the fact that devices are exposed to a simple search on the internet should not necessarily be considered as the fault of the supplier or systems integrator responsible for their install, ultimately it is the responsibility of building staff and enterprise IT departments to ensure that their devices are safe from prying eyes,” says the report.

“Ultimately, the networking of different building systems means that they are only as secure as the weakest device on the network. Therefore, to determine potential system vulnerabilities in a modern networked smart building, it is necessary to fully assess the range of systems, devices, and networks that are connected to building automation and control systems.”

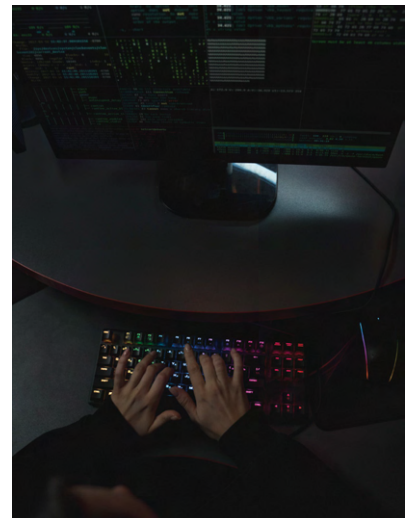
To conduct a comprehensive cyber risk evaluation of all of the devices on a particular network, a complete audit of all of the device and system connections is necessary. However, automated network scanning tools and technologies that are commonly deployed in IT environments to facilitate this audit process are ill-suited to OT environments like buildings.

As smart building OT devices and systems often run on outdated legacy protocols, they are not equipped to respond to the kinds of messaging protocols used by IT scanning processes that report back on the device status, firmware, and so on. Indeed, such scanning approaches can be positively damaging to OT environments.

Publicly available IoT device search engines, such as Shodan, BinaryEdge, or Censys, can be used to identify the scale of the threat and the sheer number of exposed devices. A 2019 study by Forescout Technologies aggregated data from searches on Shodan and Censys to discover that of the 22,902 devices discovered, 9,103 (39.3%) were vulnerable to zero-day attacks, with vulnerable devices including access control and HVAC controllers, as well as protocol gateways. For IP-connected cameras, Forescout’s research found a staggering 91.5% of which it found to be vulnerable to exploits. Checking installed devices on these search engines is a must for building managers but means they will then have to deal with the problems they find.

“automated network scanning tools and technologies that are commonly deployed in IT environments to facilitate this audit process are ill-suited to OT environments like buildings.”

“It takes no cybersecurity knowledge or networks expertise to conduct a search on Shodan and other equivalent search engines, a wealth of data related to exposed devices including the IP address of the device, geographic location (including latitude and longitude coordinates), owner, service port header information, firmware details, and available protocols are readily available to anyone with two minutes of time to spare” explains our 2022 cybersecurity report. “All the information was obtained from publicly available sources, which means the information is available for anyone motivated enough to look for it.”





Eliminating building waste with tech

Josh Eadie, CTO and founder at measurable.energy

measurable.energy

Josh is the CTO of measurable.energy, focused on the intersection between hardware, Machine Learning and Big Data. Josh and measurable.energy use innovative technology to make a tangible impact on the global sustainable future.

We all know how bad buildings typically are in terms of wasted energy. So, we're passionate about using smart technology to reduce waste within buildings wherever possible.

That's why we wanted to delve deeper into this topic with our friend Josh Eadie, CTO and founder at measurable.energy, who as it turns out, is equally as passionate about eliminating wasted energy in buildings.

Tell us more about this passion and measurable.energy's mission?

From our perspective, eliminating wasted electricity is a big, obvious step towards managing energy and our planet for future generations.

Our mission is to create energy-efficient workplaces that inspire

people to positively impact energy consumption and environmental sustainability. Our approach is to use technology to seamlessly enable energy efficiency without adding to anyone's to-do lists or interfering with a building's occupants too much.

measurable.energy is measurable by nature. Our cloud software, hardware, and business operations are all measured for environmental impact and managed to be as sustainable as possible. Our hardware is designed to be repaired, recycled, and reused wherever possible and our software is designed to use as little data and resources as possible, whilst running on carbon-neutral servers.

What is 'small power' and how is this related to wasted energy?

The level of power consumed through a building's power sockets is called "small power" (AKA "plug load" or "miscellaneous electric load"). Typical small power devices include computers, monitors, printers, chargers, meeting room equipment, and kitchen equipment like hot and cold taps.

Whilst it's easy to imagine in an office or commercial building how much energy is consumed by small power, it is typically challenging to quantify consumption as there is no standard monitoring system in place.

So what's the problem with small power?

In 2021, however, the National Renewable Energy Laboratory (NREL) estimated that small power in the US contributed to around 43% of commercial office energy usage (NREL, 2021).

The problem is that up to half of small power usage consumption is from things left plugged in or powered on during non-working hours – hence a lot of wastage is created.

Where does the m.e smart socket come into this?

measurable.energy's smart sockets (called m.e Power Sockets) measure the amount of energy that is coming from each socket, and how specifically much energy is being wasted via small power sources.

This data is then transmitted to the cloud and can be turned into insights about energy usage and wastage throughout the whole building. These insights can then form recommendations for how to manage the building's energy.

measurable.energy achieves this by combining its unique smart sockets with Machine Learning (ML) and software. This allows measurable.energy to automatically identify devices plugged into the sockets, monitor their energy use, report granular real-time data, and automatically turn individual or groups of devices on/off to prevent energy waste.

How do the m.e. sockets work?

Whilst the socket looks very much like any other socket from the outside, the bespoke circuit board design on the inside allows for ML and software combination. This is what makes these sockets unique and so powerful.

ML is used to analyze electrical signatures and load patterns of each device in real-time at 3Hz. m.e sockets measure more than 10 electrical signatures like energy, voltage, current, power factor, and more: we wouldn't want to spill all our secrets!

m.e Power Sockets collect data at very high frequency. We monitor all plugged-in devices by channel, tracking energy demand continuously over time.

This data is then used in these ways:

1. To identify the device plugged in. This gives immediate access to device energy and Greenhouse Gas (GHG) profiles across the

entirety of clients' deployment locations which in turn enables interventions to be created, measured, and reported

2. Data is then enhanced with contextual data like times of the day, locations, user behaviors, weather, etc. Here we can also integrate with other data such as from Building Management Systems (BMS) or private renewables (e.g. solar panels). This reveals the impact of contextual factors on energy usage, refining intervention management, and decarbonization plans
3. Identify wasted energy. A combination of the two above allows ML to identify when the energy is not being actively used. For example point 1 will tell us that the monitor is on standby and point 2 tells us that it is nighttime, so that energy will definitely be wasted. This allows for instantaneous visibility to energy, GHG, and cost reduction across all devices and locations automatically
4. The data above is then used by our software to create automatic actions and rules for the sockets, such as when to switch them off and on, for which devices and in which locations, etc. Our software then also delivers the reports and allows users to set their own rules via our dashboard. The data can also be used for Preventative Maintenance and Anomaly Detection

ML is the key to m.e data-driven decisions that reduce GHG emissions and total cost, by enabling automatic power switch-off at the specific socket channels when and where wasted energy is detected.

Now we know about the m.e. Power Sockets works, can you tell us a little bit about the impact indicators?

The m.e Power Socket will glow green, amber, or red according to the ratio of renewable to fossil-based energy being used. So, if the renewable energy supply on your grid is at its peak for the day, the sockets will glow green to show it's the best time to use energy. We use local building, local grid, and National Grid data to calculate this every day.

Armed with this information, we aim to help people understand the grid better, target their energy use at 'greener' times and reduce emissions. The m.e Platform can also automatically control devices according to this data; for example, you can ask our system to charge your phone at times of more renewable energy (and we can tell when your phone needs charging). The m.e Power Socket light (a very low-wattage LED) can be turned off at certain times of the day and can be configured to use a different color scale if needed.

The m.e Platform uses real-time data from the National Grid and any local energy generation data (e.g. solar panels on the roof) to create an overall picture of the mix of renewable



and fossil fuel energy being used. So, if it's a windy, sunny day, there's likely more renewable energy in use on average and vice versa.

And what are the quantifiable benefits and savings caused by these impact indicators?

Whilst we can't tell you where your electrons are coming from, we can tell the average of the regional or local electricity grid you're using; and targeting electricity use when there's more renewable energy reduces your carbon footprint.

The minimum difference between green and red is 100g of CO₂e/kWh. This means that if you charge your phone for 1 hour when green rather than red then you have just saved 100g of Carbon Dioxide Equivalent (CO₂e). When 2000 people all do this at the same time, we save 200kg of CO₂e in just one hour. As an example, if the population of Southampton (250,000 people) all had access to our socket, we could save 25 tonnes of CO₂e in one hour by charging on green. If those people did this every working day, we would avoid 6,275 tonnes of CO₂e all by changing one small behavior.


Finally, what is the use case for these impact indicators on the m.e. Power Sockets?

Throughout 30+ installations we have been able to build a wide variety of use cases. Some key highlights include a Kier installation in their temporary cabins (offices and drying rooms) on construction sites. This use case saw a 60% reduction in energy usage after the system kicked in.

We have installed our solution in co-working offices (Public), student accommodation (Yugo), commercial offices (Sky, Stantec), universities (Swansea, Reading), and local councils (Reading). Across our deployments, we reduced on average 35% of the energy cost and GHG emissions.

We have had great feedback and results from the behavioral change aspect of our sockets. When occupants are onboarded, we see additional GHG savings where people adjust their energy behaviors to show a preference towards drawing energy when green. Yugo saw energy cost reductions of approximately 35%, while also receiving GHG emission reductions in excess of 40%.





One World Trade
Center, New York
Photographer:
Felipe Barranco

We have had great feedback and results from the behavioral change aspect of our sockets. When occupants are onboarded, we see additional GHG savings where people adjust their energy behaviors to show a preference towards drawing energy when green. Yugo saw energy cost reductions of approximately 35%, while also receiving GHG emission reductions in excess of 40%.



**How does
Metrikus
fit into
all of this?**



Keith Jump, CTO at Metrikus

Keith joined Metrikus in mid-2022 as CTO and leads our technology, product, and engineering functions to build out our SaaS platform and product vision. He brings with him a wealth of experience in the digital transformation, smart building, and Prop-Tech industries, having also founded a successful smart workplace SaaS business.

We've covered a lot so far about how to make your space more productive, efficient, and sustainable, but you might be wondering; where does Metrikus fit into all of this?

Well, to uncover the answer to that exact question, we sat down with Keith Jump, our Chief Technology Officer (CTO), to ask him a thing or two about the Metrikus platform and what it can do to help make your builder smarter.

New York City, US

Photographer: Jessica Gonzalez



1

Connecting to your building's data sources

So let's start with the basics, who is Metrikus?

There are millions of data sources within buildings, providing many different data points that include information that is invaluable about a building's performance. It's all just waiting to be harnessed in the right way. And this is where Metrikus comes in.

We're focusing on helping to make buildings smarter, by first aggregating all of this building data. Whether that's data from IoT sensors, the Building Management System (BMS), the network, or anywhere else, we'll bring it together into one central place for you: our platform.

And what exactly does the Metrikus platform do?

Our platform is a Software-as-a-Service (SaaS) platform that helps organizations to create more efficient, productive, and sustainable spaces by trans-

forming your building's raw data into actionable insights.

It does this through a variety of services built within the platform, a complex rules and alerts engine, and much more that we can cover later in more detail. We like to think of it as adding a new level of intelligence that allows you to make smarter decisions about your building.

How does the Metrikus platform connect to the building's data sources?

Our cloud platform is able to connect to the built environment

securely, supporting various protocols and data integration methods, ensuring we can connect to many data sources (for example the BMS, IoT sensors, etc.) and enrich the data insights that inform decision-makers.

Crucially, after aggregating the data, our platform will also transform data from all of these different sources into a single consistent analysis-ready format. This means that you don't need to worry about the hassle of integration; our platform does it all for you.



It's important with all of this data and these insights to contextualize and to understand what it means to your people, your office space, and the planet.



2

Turning your smart building data into insights

Once the data is integrated, how does the Metrikus platform turn it into insights?

Whilst complex, our system architecture includes a number of services that enable us to aggregate and manage large volumes of data and transactions effectively and securely. As such, we're able to support data views through our own web application or via our API to support developers in creating integrations into third-party apps and building custom business intelligence (BI) reports.

We have also developed a Connector API approach, to enable us to connect data sources quickly and efficiently, allowing us to accelerate data integration, in turn extending our reach.

The platform, using a micro-service architecture, is built for scale and flexibility – as our data services mature, the opportunities

are endless in terms of real-world applications for smart buildings and actionable insights delivering true ROI to our partners and users.

Some examples of these services include:

- **Rules service** – the ability to set rules for your building's data, for example, if an indoor air quality parameter (e.g. room temperature) drops outside of a certain range, then take an action (e.g. an alert or report)
- **Scheduling service** – the ability to schedule activities to happen automatically, such as producing a report about your energy usage on a daily or weekly basis

Then we have some more specific data analytics capabilities:

- **Analysis ready data** – ability to analyze sophisticated data models at scale, through complex queries

quickly and efficiently
whether through our APIs
or application

- **Data visualization** –
through our Metrikus appli-
cation, enabling customers
to visually analyze and review
insights from our platform

What's the value of overlaying different data sets?

It's important with all of this data and insights to contextualize and understand what it means to your people, your office space, and the planet. And that's why in our platform we are building and continuously deploying the ability for you to overlay different data sets in order to do this.

For example, you can look at how your building's occupancy could impact your indoor air quality, and ultimately employee productivity and even wellbeing. Or comparing your people count to real-time energy usage to understand any potential energy wastage and cost optimization opportunities.

It is the data analytics services within our platform that delivers the complex connections and reporting capability of data, setting it apart from others. The benefit of our architectural approach is we are built for scale, ease of management, flexibility, and security.



3

Make insights actionable with our API

How can you seam- lessly integrate with the Metrikus API?

We have developed a secure public API, which enables third-party apps, custom apps, and Business Intelligence tools to make requests and query their building data easily.

Using the API allows them to leverage the functionality of the Metrikus platform, laserfocusing on their core business focus, whether that is an application, reporting, or other event-based requirements.

How secure is the Metrikus API?

Our public API is secure, requiring authentication. This means that when a user makes a data request or query via the API, they will have to authenticate using authorized and secure API keys.

As we scale our APIs, we are looking to package up various data feeds under subscriptions that meet our partner and developer community needs.

TOP OF THE PROPS



Congratulations to all the
very deserving winners of
Metrikus' first ever awards,
Top of the Props.





The no bullshit smart building project – sponsored by AirThings

Winner: Cadworks, Glasgow, Scotland

It's hard to cut through the noise these days, but Cadworks in

Glasgow has gone above and beyond. With a mission to make working easier and more enjoyable, Cadworks features modern essentials like a cycle-in ramp, activity-based spaces and a focus on community.

The smartest of the smart buildings projects – sponsored by Equiem

Winner: WaSTeLeSS Project, Switzerland

When it comes to water conservation, The WaSTeLeSS project in Switzerland is smarter than smart. By monitoring and

predicting hot water demand with cutting-edge technology, the new water management platform will increase transparency and reduce CO₂ emissions.

Commendation: Sharry, Czech Republic



Tech star 2022

Winner: Ganga Bisht (measurable.energy)

measurable.energy is on a mission to eliminate all small power wasted energy, and this involves collecting and processing huge amounts of data. We want to celebrate Ganga Bisht – the company's data whizz – who has done some incredible work

behind the scenes on all of the key algorithms and machine learning that make the product so great.



Best retrofit – sponsored by VergeSense

Winner: GMS Global Media Services GmbH (Allianz Real Estate Sky Office)

We're big fans here of the old adage that the most sustainable

building is one that already exists, and this is definitely the case with the upgrade to Allianz Real Estate's Sky Office in Düsseldorf. This prominent office building, housing many renowned businesses, is now a data-driven space that is fit for the future.

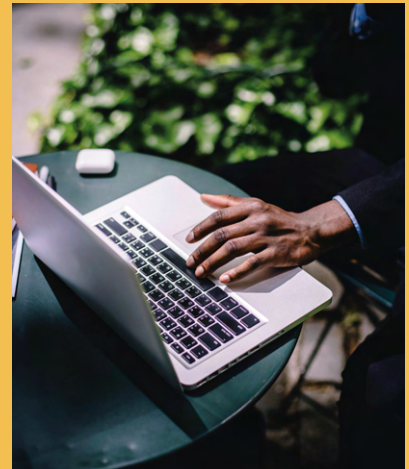
Unsung hero

Winner: Peter Brooks (Accenture)

This category is all about celebrating the person who's always trucking away in the background making sure everything gets done, and who better to call out than Peter Brooks. For the past 12 months, he has been the man on the ground, getting his

hands dirty every single day to move Accenture's smart building deployment forward.

Commendation: Jack Lake and Lyndsay Close (amBX) – joint



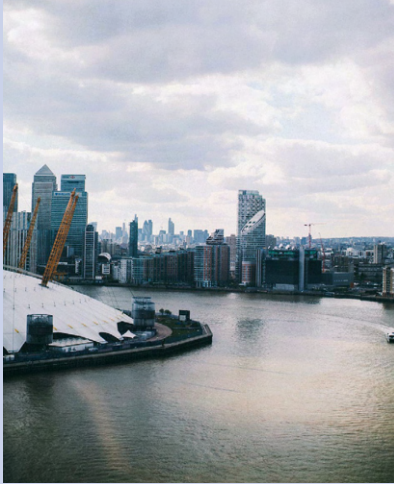
Tech for Good pioneers

Winner: amBX

We love seeing tech being used to improve the world around us, and amBX's lighting platform, SmartCore, does just that. Based on circular economy principles, this innovative system future-proofs existing infrastructure and brings data together

from disparate systems to make buildings more sustainable.

Commendation: Ailuna



Collaboration of the year

Winner: Equiem and Canary Wharf Group
London, UK

Canary Wharf Group has teamed up with Equiem to bring everything London's central business district has to offer into a single online platform.

By improving the experience of residents, office occupiers, retailers, restaurateurs, and visitors alike, this collaboration is certainly making Canary Wharf a destination in its own right.

Power product 2022

Winner: SmartServer IoT (EnOcean)

SmartServer IoT represents our favorite kind of tech – flexible, extensible, and easy to use. With a unique combination of an open standards-based approach, along with end-to-end integra-

tion support, SmartServer IoT enables efficient development and integration, transparent licensing, and straightforward support for system extensions.



Right: New York City, US
Photographer: Jesica Gonzalez





Acknowledgements

We'd like to say a huge thank you to...

Above:
New York City, US
Photographer: [Jessica Gonzalez](#)

Right:
Blackfriars, London, UK
Photographer: [Jamie Kettle](#)

Contributions from

Michael Beckerman, CEO at
CREtech

Emma Bestley, co-founder at
YesColours

Francesca Brady, CEO and
co-founder at AirRated

Lewis Bramfitt, CEO at
Bramfitt Technology Labs

Dave Cairns, Senior Vice President –
Office Leasing at CBRE Canada

Nancie Calder, Global Digital Sales &
Service (D365) Center of Excellence
Executive at Avanade

Laila Datto, Workplace Wellbeing Expert and Mindfulness Trainer at a.life.more.mindful

Alfredo Díaz-Araque Moro, founder at Spanish PropTech

Tony DiBenedetto, CEO at Appspace

Josh Eadie, CTO and founder at measurable.energy

Laura Fuentes-Dominguez, Senior Manager, Intelligent & Digital Workplace at Accenture

Michael Grant, COO at Metrikus

Richard Gregory, Global Head of Value Realization at Avanade

Miranda Hill, Innovation and Sustainability Lead at Avanade

Rasmus Hyltegard, Director of Advanced Analytics and Retail Industry & AI Capability Lead, and Azure CoE at Avanade

Keith Jump, CTO at Metrikus

Uwe Klatt, VP of Partnerships at Metrikus

Laura Lian, CMO at Kaiterra

James Lockyer, Director of IoT Sales at Microsoft

Josh McDonald, Global Connected Workplace Lead at Avanade

James McHale, CEO at Memoori

Harry Morphakis, Senior Manager at Accenture

Corinne Murray, founder at Agate

Sami Mustapha, ESG Consultant at Metrikus

James Palmer, Head of Pre-Sales and BMS at Metrikus

Caleb Parker, founder at Bold

Susana Quintás, Country Manager at Metrikus, Spain and LATAM

Tommy Russo, SVP of Technology and Engineering at Akridge

Stefanie Sebald, Head of Design at Kitt

Danny Stubbings, Vice President, Technology, Data & Analytics at Oxford Properties

John Stubbs, co-founder at YesColours

Ivo Van Breukelen, Managing Partner at The PropTech Connection



Photographs by

Felipe Barranco
Jane D'Souza
Jessica Gonzalez
Jamie Kettle
David Rowland
Tom Sassi

Caitlin Rozario
Jane Robathan
Sally Scott
Miriam Velázquez
Emily Vernon

Designed by

Natalie Bondfield

Edited by

Caitlin Rozario

Produced by

Joe D'Souza
Charlotte Laing
Sami Mustapha




Above:
The Oculus, World Trade
Center, New York City, US
Photographer: Jessica Gonzalez

Right:
St Paul's Cathedral, London, UK
Photographer: Jamie Kettle

Get in touch

If you have any feedback or questions about this magazine, we'd love to hear from you.

Email : Charlotte Laing, CMO
charlotte@metrikus.io




A massive shout
out to the wider
Metrikus team
who have been
so supportive
in the making of
The Measure.

A full-page background image of a forest. Tall, slender trees with green foliage are visible. Sunlight filters through the canopy, creating a warm, golden glow on the right side of the image. The foreground is dark and shadowed, with some green undergrowth visible.

Sustainability matters

The making of the magazine



It was really important for us to make the production of this magazine as sustainable as possible, so we worked with UK-based company, AllNote, to minimize our impact.

All of the paper comes from non-endangered, sustainable sources and can be traced back to its origin.

AllNote's production headquarters, PrintCenter, has also worked with environmental advisors as part of the SMETA certification scheme.

Finally, the shipping route combines ship freight, train freight, and truck freight to avoid the high emissions that occur when only using trucks.



metrikus

There are thousands of data
sources within buildings, just
waiting to be harnessed in the
right way.

That's where Metrikus comes in.



A single platform

to connect all of your building's data

www.metrikus.io

Make your building work smarter,
not harder



metrikus

info@metrikus.io

www.metrikus.io

United Kingdom:

10 Arthur Street,
London,
EC4R 9AY

United States:

1177 Avenue of the Americas,
5th Floor,
New York,
NY 10036