

POST COVID-19 – RECOVERY

Looking Beyond COVID-19:
Office buildings in China to
become smarter at
improving user and visitor
health and safety

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GREATER CHINA OCCUPIER RESEARCH



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EXECUTIVE SUMMARY

Smart office buildings today are buildings that enable data-based management systems to function.

Fundamentally, these systems facilitate the collection of data via the Internet of Things (IoT) and connected hardware, such as sensor devices. Data is then analysed using specialised software and, from this analysis, resulting building management work actions are disseminated to address specific property-related issues. When these actions are carried out in a timely manner, good data-based management systems generally result in heightened landlord and user satisfaction. They also help reduce risk and enhance cost efficiency associated with the property.

Moving one step forward, truly cognitive, or truly smart, office buildings are able to seamlessly link different parts and pieces of an office building into one cohesive, dynamic and practical operational platform.

Really smart office buildings are only just appearing in China. Many more will follow.

Fundamentally, very smart office buildings are buildings which are able to independently integrate IoT software and hardware and, in turn, learn system and user behaviour.

Truly smart office buildings will be able to add value to owners and occupiers in China in so many ways, but six key aspects are:

- Cost reduction;
- User productivity enhancement;
- Environmental sustainability

augmentation;

- Talent retention and attraction;
- Wellbeing enrichment, and;
- Brand improvement.

An important part of office building wellbeing is office building health and safety, and smart office building technology can assist in this by:

- Utilising linked thermal scanners to quickly identify and isolate users and visitors who are unwell, as they enter the office building;
- Engaging smart cleaning systems to more efficiently and effectively clean high-use areas and high-use surfaces in localities throughout the building;
- Automating the regular replacement of air filters in central HVAC systems;
- Ensuring a central HVAC system's disinfection and sterilisation capabilities are operationally optimised at all times;
- Making sure airflow throughout the entire office building is correctly distributed at any given time, as this is also key to intra-office virus cross-infection prevention;
- Making certain office building airtightness and air pressure are correctly utilised to repel virus penetration and spread, and;

- Employing smart touchless technology and devices.

Ahead, other smart office building health and safety technology on the horizon, such as UV light sanitising, once fully developed, will also be adapted and incorporated into smart office buildings.

Finally, given COVID-19 and the overwhelming impact it has had not just in China but across the world, the likelihood is there will be an even greater motivation for office landlords in China to develop/own office buildings that are fully cognitive in the future - with smart office building health and safety technology being a greater driving factor for going cognitive.

The COVID-19 outbreak has been an unprecedented event in China. Its consequences have been felt across geographies, society, the economy and the property market in the country.

The COVID-19 outbreak is anticipated to influence China's real estate market on many levels. In this report, we draw attention to one aspect: smart office buildings. And given the outbreak of COVID-19, we look at how these buildings in China could become smarter at improving user and visitor health and safety. In this report, we specifically look at:

- What a smart office building is;
- What a smart office does;
- The reality of smart office building control systems today;

- The six value-adds associated with smart office buildings;
- Smart office building wellbeing;
- The utilisation of smart office technology to improve office building user and visitor health and safety, and;
- An understanding of what lies ahead for smart office buildings in China.

WHAT IS A SMART OFFICE BUILDING?

In the past, office building owners globally have chosen, installed and run lighting, security, heating, ventilation and air conditioning systems quite independently of one another. Today, however, office building owners around the world are looking beyond this and are thinking about:

- The goal for their building;
- The economic viability of their building, and;
- The impact of their building on the environment.

To satisfy these aims, smart office buildings globally have become ever more prevalent. But these buildings need to do more than just offer comfort, light and safety. Smart office buildings need also to link the different parts and pieces of an office building into one cohesive, dynamic and practical smart building platform. This platform will not only allow owners and operators of a smart office building to effortlessly achieve their objective for the property but will also allow the building to:

- Reduce water and energy usage costs;
- Alleviate any impact on environmental sustainability, and;
- Better attract and retain tenants.

Truly smart office buildings are only just coming to the fore. Many more will follow. Essentially, truly smart office buildings are office buildings that are able to autonomously desegregate IoT software and hardware devices and, in turn, learn system and user behaviour to boost building performance.

WHAT DO SMART OFFICE BUILDINGS DO?

At the basic level, a smart office building delivers expedient building services (including value-added services for businesses, energy and operations services, comfort and productivity services, space adaptability and attractiveness services, and connected infrastructure services) that allow users to be productive at the lowest cost whilst having the least environmental impact over the office building's lifespan (Figure 1).

In particular, such expedient office building services can include:

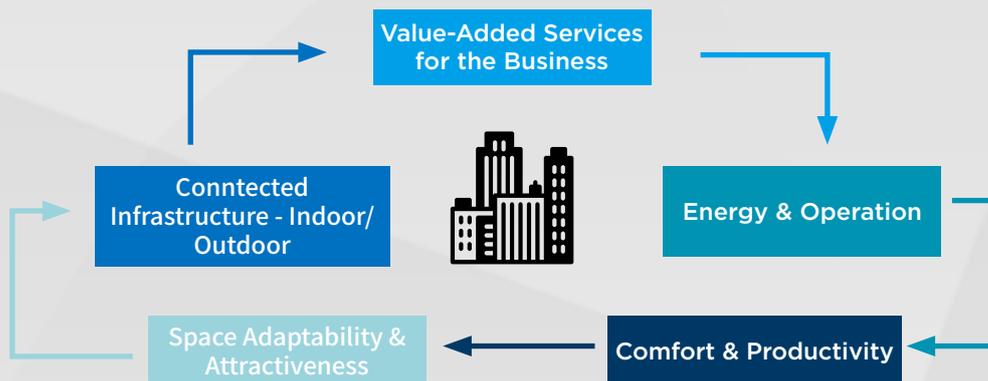
- Sufficient lighting;
- Acceptable thermal comfort;
- Satisfactory air quality;
- Suitable security;

- Acceptable sanitation, and much more...

Attaining smart office building status entails adding intelligence, either at an office building's design stage or at mid-life via a retrofit. This intelligence should be upgraded right the way through the rest of the office building's useful lifespan in the form of information technology (IT) or more particularly, IoT technology. This technology enables an assortment of office building subsystems (including their hardware and software), which usually function autonomously, to be linked. These subsystems can then share information and data to encourage proactive building management and augment the entire performance of the office building.

Figure 1:
Basic functions of a smart office building

Source: Acuity Brands, Cushman & Wakefield Research



Empowered by technology, a smart office building is able to link the building structure itself with its functions to produce actionable information and effective results. It can do this by:

- Linking building hardware and software control systems;
- Linking building users with technology;
- Linking in with cost reduction;
- Linking in with environmental sustainability
- Linking in with building security;
- Linking in with building health and safety, and;

■ Linking to a smart future.

By achieving these linked goals, smart office buildings are then able to produce a number of value-added asset management benefits, including:

- Optimised predictive maintenance;
- Improved energy saving;
- Just-in-time plant, machinery and equipment refurbishment/servicing/replacement;
- Enhanced project cleaning, and;
- Recommended space redesign and re-fit (Figure 2).

Figure 2:
Five value-added asset management benefits enjoyed by smart office buildings

Source: *The Agility Effect*, Cushman & Wakefield Research

The use of sensors built into infrastructure and data collected in smart buildings allows for a significant improvement in the management of buildings in the service sector. Focus on five benefits regarding space management and energy savings.

1 PREDICTIVE MAINTENANCE

Sensors can gauge a building's technical performance and activate maintenance procedures in the event of equipment malfunction event before an alert is triggered.

2 SAVING ENERGY

Data sent by sensors are analysed, prompting temperature or lighting adjustments.

3 JUST-IN-TIME EQUIPMENT REPLACEMENT

Monitoring equipment allows for more effective management of its lifecycle. As a result, equipment is replaced when maintenance becomes too costly or when it reaches the end of its manufacturer-set service life.

4 OPTIMISED SITE-CLEANING

Presence sensors optimise cleaning operations. The data they collect enable facility managers to assign cleaning staff specifically to spaces that have been used and require cleaning.

5 REDESIGNED SPACE

Sensors help identify overused and underused areas in the building. As a result, recommendations can be made for redesigning and optimising space.

THE REALITY - SMART OFFICE BUILDING CONTROL SYSTEMS TODAY

Office buildings today encompass much plant and machinery and complex control systems, as well as a variety of platforms to augment user productivity, safety, and comfort. A number of these systems involve device-to-device interaction, but due to the data being broad in nature and the communication procedures being proprietary, data and information, in many instances, only flow in certain directions. In fact, according to IBM

Research & Watson IoT, as much as 90% of data generated by buildings generally today is 'dark data'; in other words, data that is never utilised (Figure 3).

However, a true smart office building, today and in the future, can incorporate interactions and linkages between all devices and systems in the building (Figure 4).

Figure 3:
The darkness of Big Data

Source: IBM Research & Watson IoT, Cushman & Wakefield Research

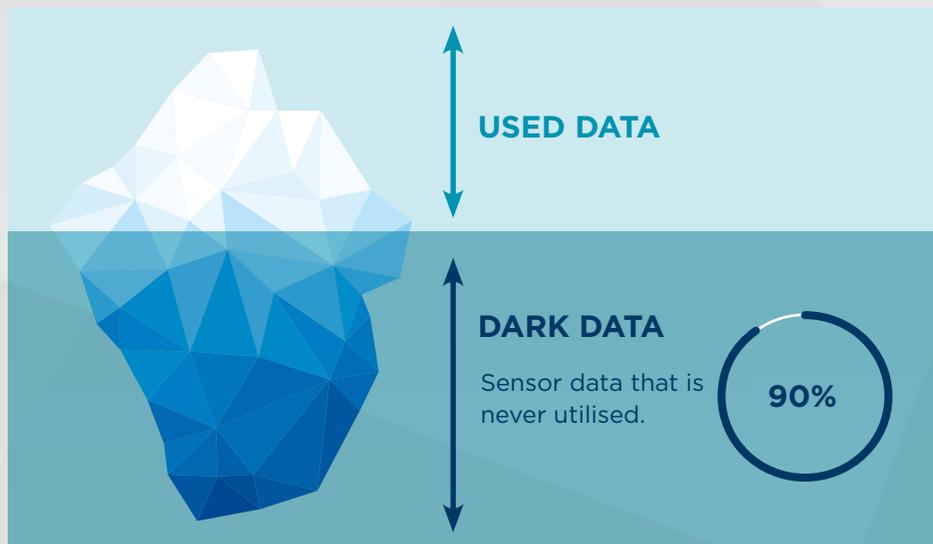
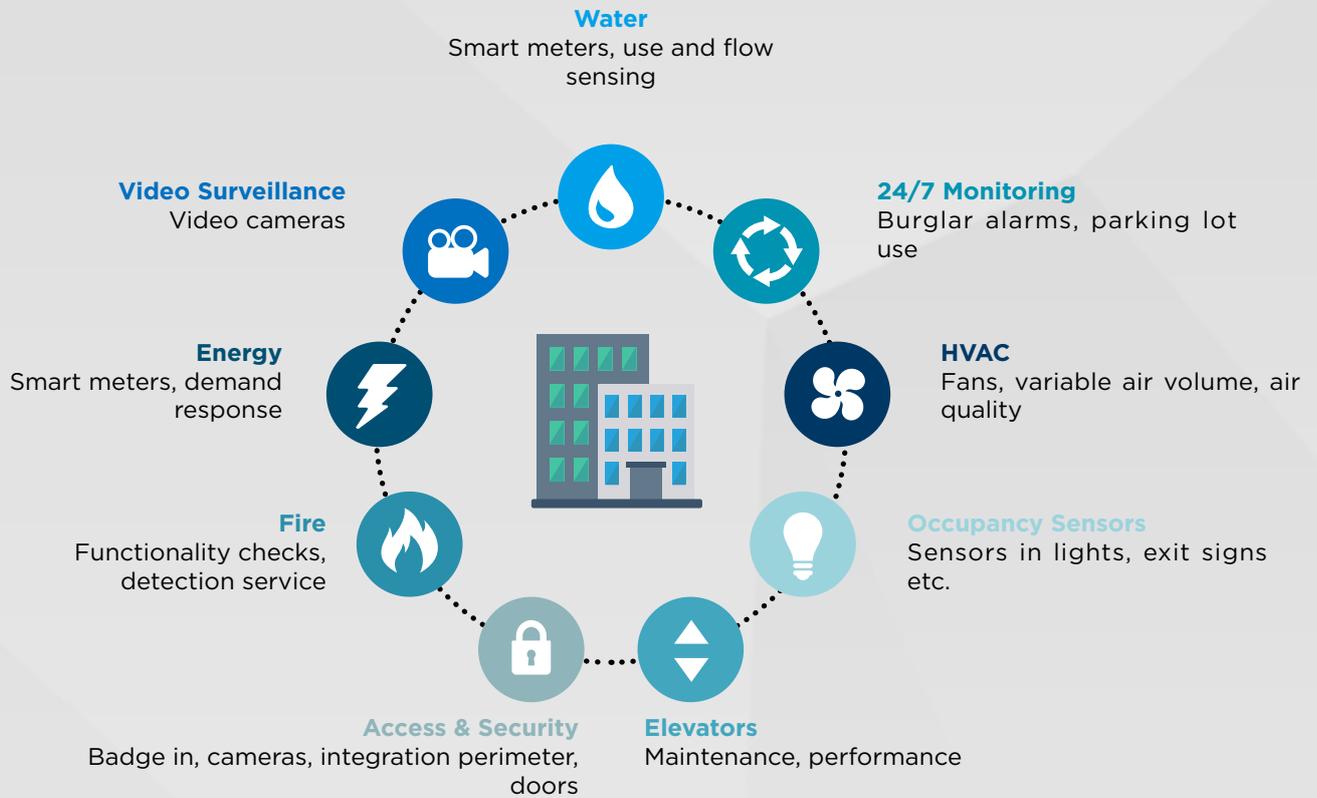


Figure 4:
Linked systems in a smart building

Source: *allthingsfirst.net, Cushman & Wakefield Research*



Chiller plant optimisation is one example. Here, operational efficiency is augmented by including weather and climate data and information. An additional example is where data from the office building security system is used to switch lights off and cut cooling/heating in areas not being used by users.

When data and information flows unrestrictedly between connected devices and sys-

tems, then lighting, air conditioning, security and other systems are operated at a much higher level of efficiency. The result is an office building that is not only safer and more comfortable (thus providing happier users with the right conditions to be as productive as they possibly can be) but is an office building that generally has a lower cost of operation.



6

SMART OFFICE BUILDINGS - THE SIX VALUE-ADDS

Truly smart office buildings in the future will be able to add value to landlords and/or users in six ways and they are:

- Cost reduction;
- User productivity enhancement;
- Environmental sustainability augmentation;
- Talent retention and attraction;
- Wellbeing enrichment, and;
- Brand improvement.

SMART OFFICE BUILDING WELLBEING

Smart office buildings have the ability to autonomously alter levels of indoor comfort and, in turn, enrich user and visitor wellbeing. In particular, an office building that offers the right level of comfort at all times is a building where the users can be at their most productive. In this environment, a smart office building also has the potential to ensure employee sick leave days are kept to a minimum. Temperature, ventilation, indoor air quality, light, and ambient sound can all be adjusted au-

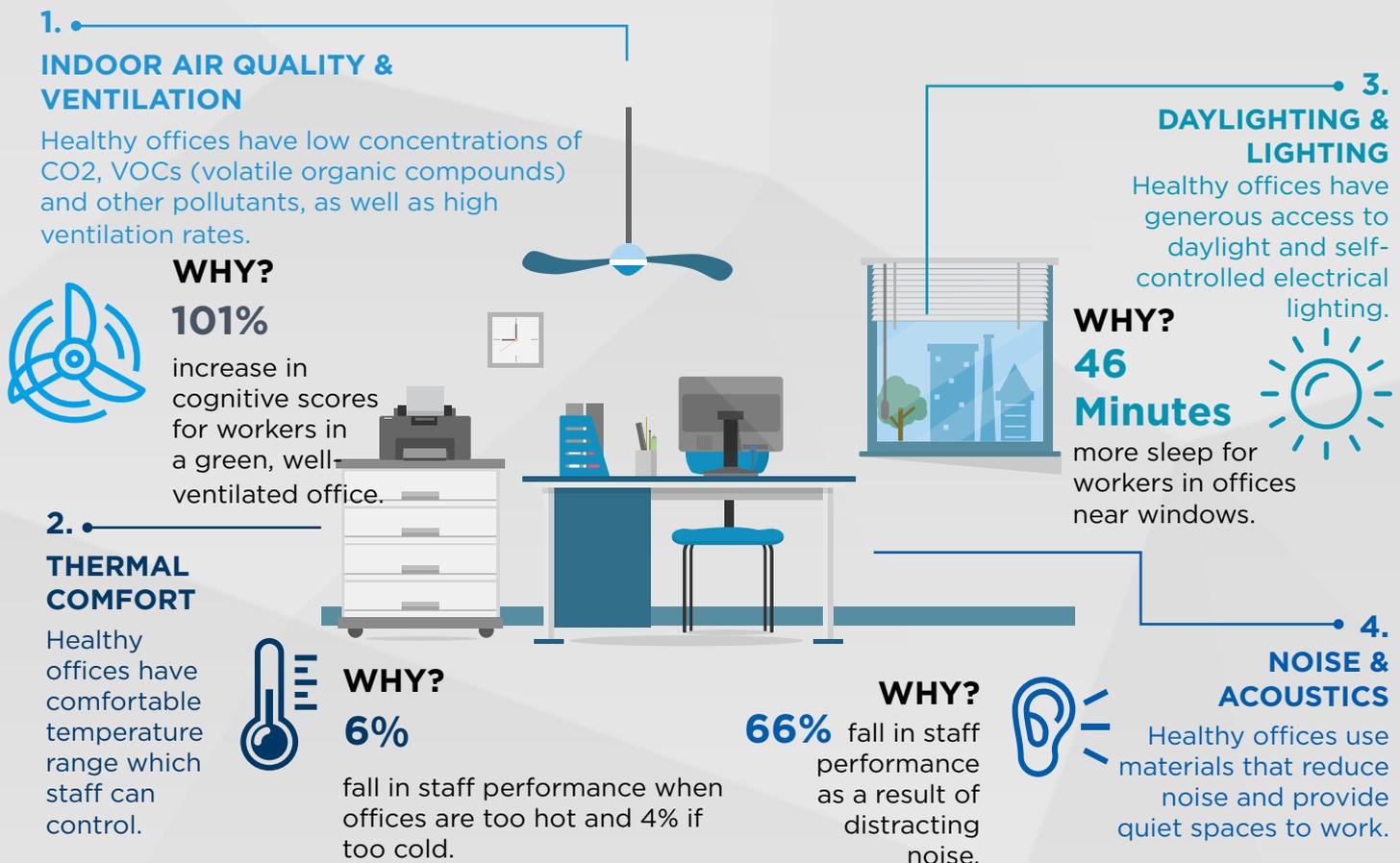
tomatically by a smart office building (or by users via smart mobile apps) to suit:

- The user/s;
- The nature of the work being carried out, and;
- The outside climate conditions...

...at any given time (Figure 5).

Figure 5:
Four smart office building features that promote wellbeing

Source: World Green Building Council, Cushman & Wakefield Research



SMART OFFICE BUILDINGS AND THE UTILISATION OF TECHNOLOGY TO IMPROVE USER AND VISITOR HEALTH AND SAFETY

An important part of office building wellbeing enrichment is office building health and safety. Apart from providing optimised thermal comfort, ventilation, air quality and lighting, smart office buildings also have the potential to improve the health and safety of their users and visitors in many other ways.

When considering a virus outbreak, such as COVID-19, one other health and safety improvement action is to quickly identify and isolate users and visitors who are unwell, as they enter the office building. This can be done by installing a thermal scanner at the building entrance. This scanner can be used to quickly and unobtrusively recognise those building users and/or visitors who are ill. Then, by intelligently linking the thermal scanner readings to the building's security system, those unwell users and/or visitors can be quickly taken aside and isolated by the office building security staff before they enter the building proper.

Quickly recognising unwell office building users and visitors is one thing, another is to eradicate the virus itself. It is now well known that viruses, like COVID-19, can remain on surfaces for some time and these surfaces act as prime vector points for the spread of the disease.

Here is where smart cleaning - cleaning that is supported by smart software and devices - can come into its own. In this instance, tracking sensors can be used to rapidly identify where office building users and/or visitors have been in order to more efficiently and effectively clean high-use areas and high-use surfaces in localities throughout the building.

Just as in the case of normal flu, airborne transmission is another major mode of diffusion for a virus, such as COVID-19.

Related to airborne transmission, for those

offices using central air conditioning, smart office software technology can be linked to the office building's central HVAC system to automate the regular replacement of air filters. What's more, for those office buildings which have a central HVAC system, which has disinfection and sterilisation capabilities, such as ultraviolet, nano-photon and catalytic oxidation technology, this same smart office software technology can be also used to better ensure that the air conditioning system disinfection capability is operationally optimised at all times. Additionally, smart office building software technology can be linked to the office building's central HVAC system and sensors throughout the building to make sure airflow throughout the entire office building is correctly distributed at any given time, as this is also key to intra-office

virus cross-infection prevention.

Office building airtightness and air pressure are also important features that are effective precautionary measures to help mitigate the airborne spread of viruses, such as COVID-19. To prevent air particulates from entering the building in the first place, automated smart office technology can be utilised to ensure a positive pressure environment is in existence throughout much of the office building at any given time.

What's more, a negative air pressure environment in those specific localities within the office building where viruses and bacteria can lurk, such as toilets, in order to funnel air out and away from other areas in the office building, could also be ensured by the usage of automated smart office building technology (Figure 6).

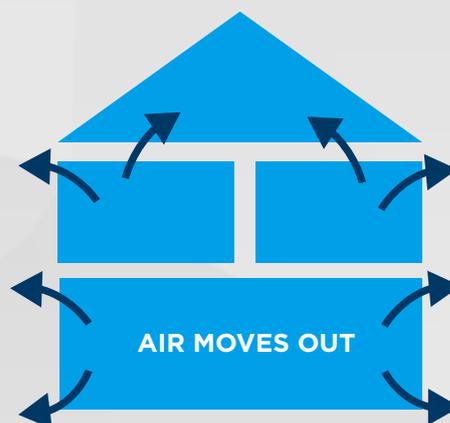
Figure 6:
Positive and negative air pressure in a building

Source: yellowblue, Cushman & Wakefield Research

Positive Air Pressure

Air pressure inside is greater than pressure outside

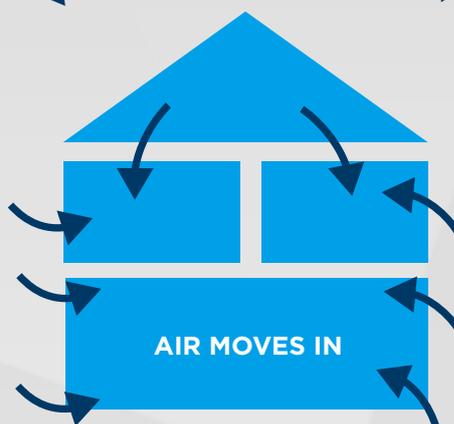
Air gets pushed to the exterior envelope



Negative Air Pressure

When indoor air pressure is lower than pressure outside

Outside air rushes in to try and balance out the pressure difference



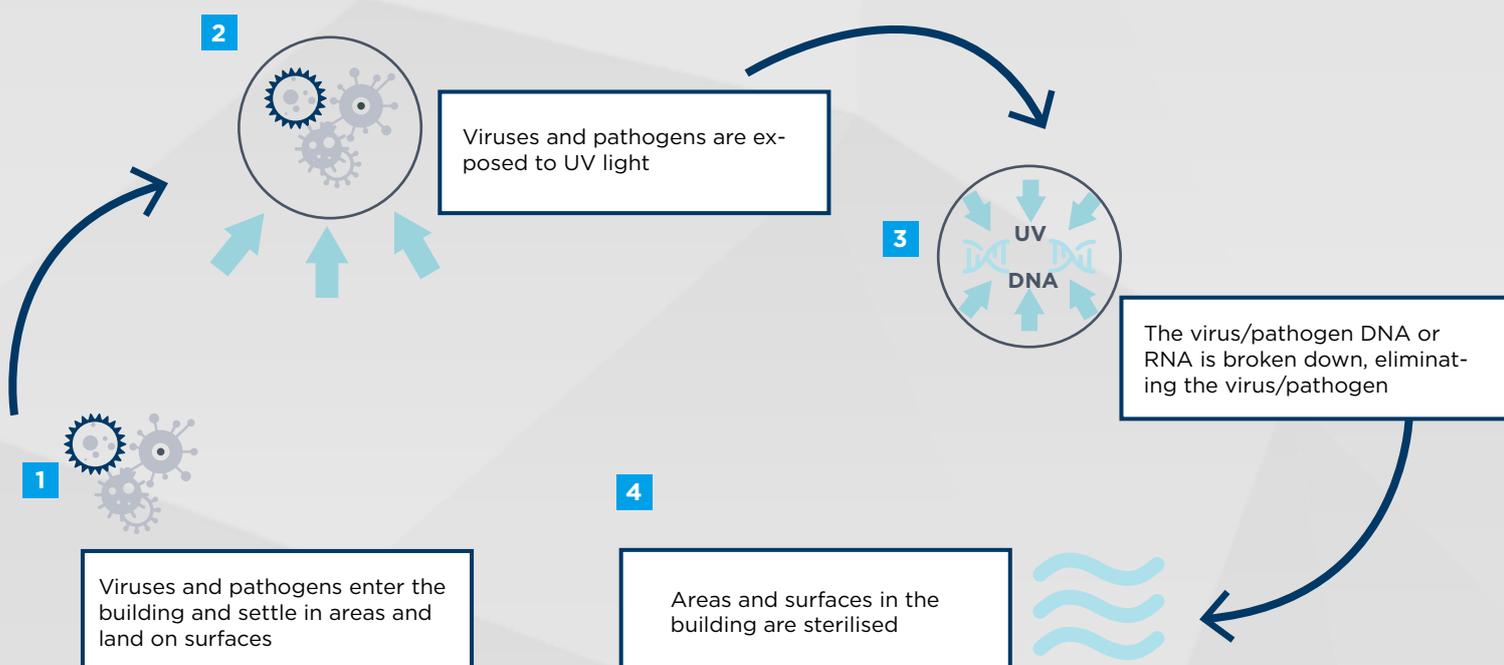
Smart office building automation is continually developing. As it does, it is increasingly becoming touchless. Given the greater awareness that office users and visitors alike have regarding how a virus can be spread, these groups of people will be reluctant, certainly for some time after the COVID-19 outbreak, to touch office items such as light switches, lift buttons, door handles or wall mounted room air conditioning controls. Given this, in the future, we expect the fitting/retrofitting of smart touchless technology and devices, such as facial-recognition-activated automatic doors, voice-activated lifts and mobile-phone-controlled room lighting and air conditioning to increase in office buildings.

infancy in terms of technical development – given the risk of human exposure and its current inadequate capacity to sterilise dark areas of an office building – UV light sanitising, where concentrated UV light is used to “fry” pathogens and viruses on all reachable exposed surfaces, has promise. Further development of the technology, the tactical placement of lights, and essential design changes to indoor office spaces, will need to be carried out to fully realise the potential that UV light exposure has, and the health and safety value-add it can bring to a smart office building (Figure 7).

Looking ahead, even though it’s still in its

Figure 7:
How UV light technology could target viruses and pathogens

Source: Cushman & Wakefield Research



WHAT LIES AHEAD FOR SMART OFFICE BUILDINGS IN CHINA?

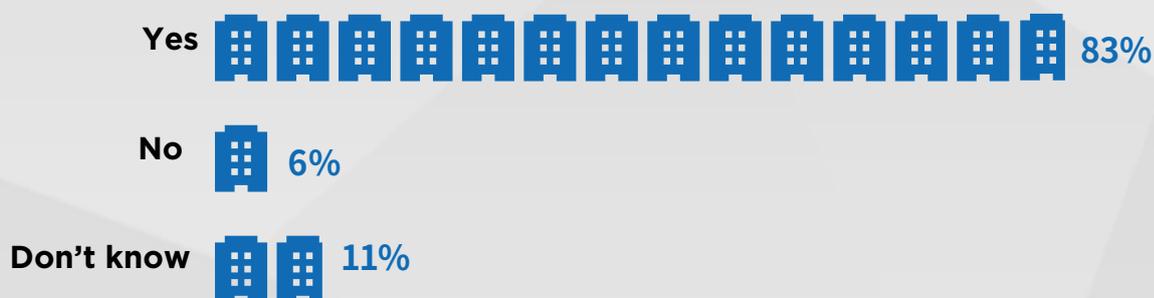
The topic of smart office buildings has garnered much attention in China over the last half-decade or so. The recent speed of associated technological development has been rapid. Today, a plethora of smart software, smart sensors, smart devices, building plant and machinery and other building systems have already been linked to centralised smart platforms, and have been operationalised in many office buildings up and down the country. Ahead, and according to a recent survey we conducted last year, the on-the-ground feeling of office landlords in China is that only

more of these types of office buildings will be present in the country in the future (Figure 8).

Moving the ball further forward, given COVID-19 and the overwhelming impact it has had, not just in China but across the world, if we conducted our survey today, it is likely that an even greater number of respondent office landlords in China would expect office buildings in the country to be fully cognitive in the future – with smart office building health and safety technology being a big motivating factor for going cognitive.

Figure 8:
In 20 years' time, do you expect the majority of prime office buildings in the city of your chosen city to be fully cognitive?

Source: Cushman & Wakefield Research



Smart or cognitive office buildings can connect various parts and pieces of an office building into one unified, dynamic and viable smart building platform.

Truly smart office buildings are only just coming to the fore in China. Many more will follow. Essentially, truly smart office buildings are buildings which are able to autonomously desegregate IoT software and hardware and, in turn, learn system and user behaviour.

Truly smart office buildings will be able to enhance value to owners and occupiers in China in so many ways, but six key attributes are:

- Cost reduction;
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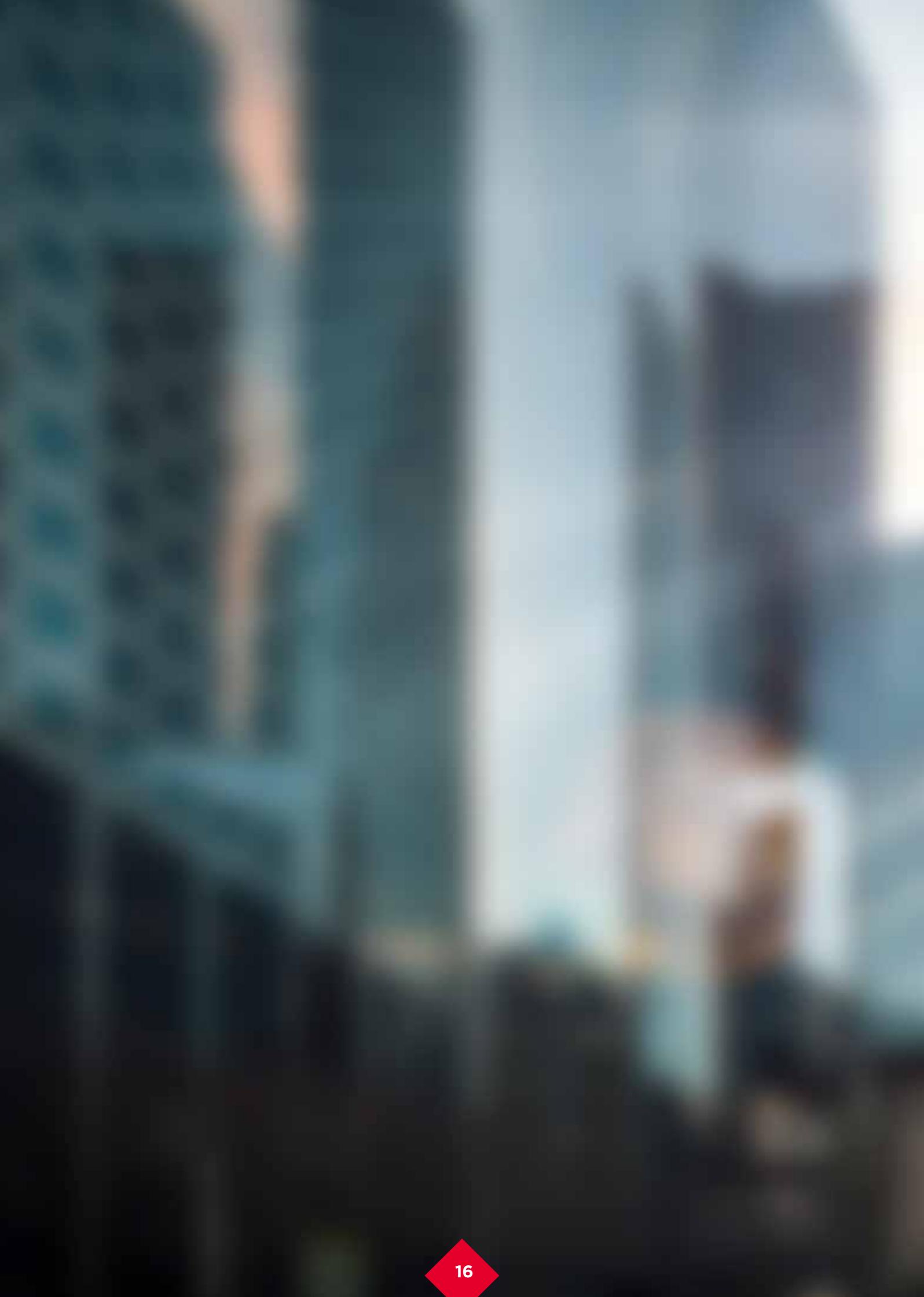
- Utilising linked thermal scanners to quickly identify and isolate users and visitors who are unwell, as they enter the office building;
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Ahead, other smart office building health and safety technology on the horizon, such as UV light sanitising, once fully developed, will also be adapted and incorporated into smart office buildings.

Finally, given COVID-19 and the overwhelming impact it has had not just in China but across the world, the likelihood is there will be an even greater motivation for office landlords in China to develop/own office buildings that are fully cognitive in the future – with smart office building health and safety technology being a greater driving factor for going cognitive.





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