RE!MAGINING CITIES WITH DIGITAL TWINS

at the intersection of proptech, real estate & smarter cities

This is our publication and attempt to explain the potentials of a "phased approach" to Digital Twin deployment to help accelerate smarter & greener built environments and communities. Easy and quick to deploy and lots of data to reap to enhance better decisions. The three initial areas of Digital Twin Phase One would include:

1. Energy optimization
2. Health & well being
3. Space optimization

This document includes several case studies from proptech companies to demonstrate how some of the solutions work. Re!magining Cities is quite active in the proptech space to better understand how the real estate community is adopting technology to improve the performance of their assets. And, we want to combine these areas with some of the objectives of Smart Cities so that they can also be actively engaged in the development of Digital Twins in their local jurisdictions. For a smarter and greener future!

GLOBAL PROPTECH OVERVIEW

by Re-Imagining Cities – November 2019

Proptech, short for Property Technology, is a term that describes the digital transformation in the real estate sector. It refers to businesses that use technology to disrupt and improve the way we buy, rent, sell, design, construct and manage property. Several years ago, no one talked about Proptech. Real Estate industry was generally considered to be sluggish at embracing and adopting innovation. There were very few companies trying to digitalize the industry. Today there is a vast interest in Proptech. Its landscape is changing dramatically, and the market is developing at a rapid pace. Proptech has become a truly global phenomenon.

Global leaders in real estate are rapidly adopting technologies to better manage their real estate assets. Enhancing the end-user experience becomes the new mantra of how to stay competitive while driving down operational costs and maximizing profits. Co-working is changing the way offices look, operate, and managed. Proptech plays an essential role in the evolution of space as a service. More reliance on technology in real estate raises more privacy and cybersecurity concerns while utilizing Big Data analytics for decision making is becoming a norm. This rapid growth and complexity of the landscape makes understanding the opportunities and navigating the risks in Proptech an ever more challenging endeavor.

The number of startups entering this space grows exponentially each year. To some estimates, there are over 3000 Proptech companies around the world. More countries are establishing Proptech associations and organizing Proptech focused conferences. The biggest conferences set the Proptech narrative for the whole industry. These conferences are MIPIM Proptech, Future Proptech, RealComm & iBcon, Expo Real, and Provada. There are many smaller-scale events organized by local Proptech initiatives that focus on fostering their domestic Proptech ecosystem and market.
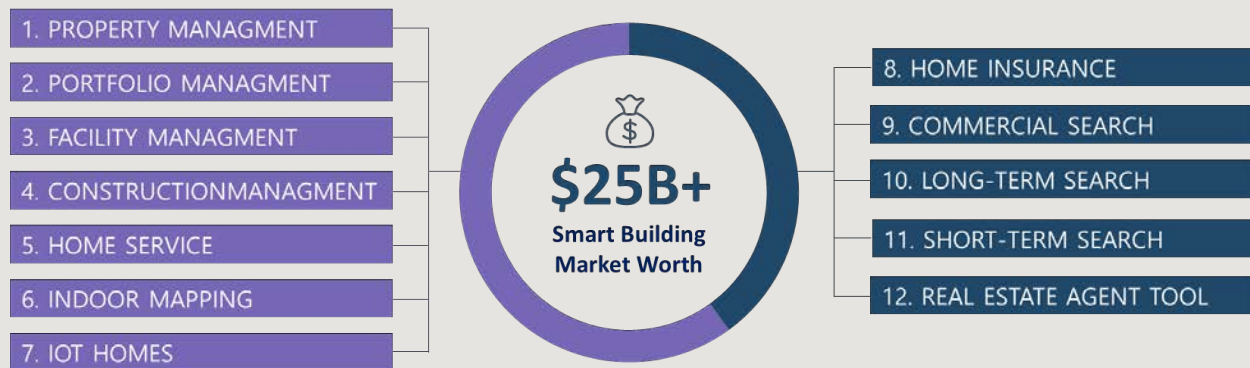

Source: Venture Scanner "Technology in Real Estate Sector Report, ING"

There's no shortage of capital resources as the investors see an enormous market opportunity in Proptech. However, there seems to be no consent among the industry stakeholders on Proptech's definition and its range of scope. There have been debates on whether to include co-working and co-living space companies as a part of Proptech.

When it comes to funding, several studies reported completely different figures. Venture Scanner, an analyst and technology powered research firm reported that 2018 global Proptech funding reached $19.9Bn, while RE: Tech put that number at $9.6bn and CB Insights has it at the lowest $3.4Bn. Misinformation about the Proptech market is not the only challenge in the industry. The adoption cycle assumptions, capital misalignment, competition for talent, and miscommunication between startups and real estate people are other obstacles that need to be addressed.

Several research publications help make sense of what's happening in Proptech. Venture Scanner has a quarterly report that tracks the global Proptech landscape. They've identified twelve Proptech categories. More than half of those categories belong to the Smart Building sector. The technologies behind them are helping the real estate sector and cities solve the most pressing urban challenges: sustainability, urbanization, and people's health & well-being.

1. PROPERTY MANAGMENT
2. PORTFOLIO MANAGMENT
3. FACILITY MANAGMENT
4. CONSTRUCTIONMANAGMENT
5. HOME SERVICE
6. INDOOR MAPPING
7. IOT HOMES

$25B+
Smart Building Market Worth

8. HOME INSURANCE
9. COMMERCIAL SEARCH
10. LONG-TERM SEARCH
11. SHORT-TERM SEARCH
12. REAL ESTATE AGENT TOOL

Source: Venture Scanner "Technology in Real Estate Sector Report, ING"

From these seven categories that directly relate to the built environment rather than to property brokerage or insurance there are three that relate the most to Smart Cities: Energy Efficiency, Space Optimization, and Health & Well-Being.

Energy Optimization

Buildings are responsible for nearly 40% percent of global energy consumption. The built environment will go through unprecedented expansion as 60% of the buildings that will make up the world's fastest-growing cities by 2050 are yet to be built. Driving down energy use in buildings will be one of the crucial items in lowering GHG emissions. It will help to battle Climate Crisis and create sustainable livable cities.

There are several incentives for the real estate sector in optimizing the energy usage in their portfolios:

- saving money by driving energy cost down
- optimizing assets' performance and reducing maintenance cost
- increasing profit and improving valuation
- reducing peak load and detecting malfunctions and defaults
- freeing up capital from building efficiency for other strategic investments

Health & Well-Being

Smart cities are focusing a lot of their services toward improving the lives of its citizens. According to several research studies people spend about 90% of their time indoors. The pollutant levels can be higher indoors than outdoors.
A 2015 joint study between Harvard T.H. Chan School of Public Health and Syracuse University and SUNY Upstate Medical University, showed a direct link between cognitive function and indoor environment. The study tested employee performance in environments with "healthy" and "unhealthy" air. In healthy air conditions, the results yielded performance improvements valued up to £11,500 in additional revenue per employee per year.

Employee productivity and cognitive ability can increase by up to 50% in a "healthy" building environment. Addressing Health & Well-being in buildings improves peoples' health and efficiency. It helps building owners and managers attract and retain tenants and employees. Those employees have less "sick days" and enjoy a better working environment provides them with the comfort of an indoor air quality, thermal, lighting and ventilation controls.

Space Optimization

With rapid urbanization, cities need to deal with an incredible influx of people moving into cities to live, work, and play. The UN estimates that approximately 1.5 million people move into cities per week. With a scarcity of land and resources, building more buildings to accommodate the growing urban population becomes even a bigger challenge. Thus, there is a need for technology to help us be more efficient in the use of our resources.

CASE STUDIES

Switch Automation

www.switchautomation.com

Switch Automation is a smart building platform that drives energy efficiency, equipment optimization and occupant comfort for existing Real Estate Portfolios. Over 2500 buildings around the world utilize their solution to save on energy and equipment maintenance costs. Switch Automation was deployed by Oxford Properties, a global real estate company that manages over $45 billion of real estate assets on behalf of its co-owners and investment partners, with a global portfolio spanning over 60 million square feet. Switch Automation have documented $430k in savings across 7 sites for the last 12 months. That equates to an excess of $6M in portfolio value with an applied cap rate of 7% for retail spaces.

Recently the company have installed another 5 Oxford sites and have a plan to working with city governments in the effort of optimizing publicly owned real estate portfolios. Below is Switch Automations' Case study for first two Oxford Properties sites it was deployed in Upper Canada Mall and WaterPark Place.

Improving operational performance to save $160k in 3 months

CLIENT:

Oxford uses the Switch Automation Platform to help enhance their existing building operations by connecting systems and data to provide real-time visibility into building performance and implement data-driven optimization strategies.

SOLUTIONS:

Within the first three months on the Switch Platform, Oxford uncovered equipment and building optimization opportunities totaling $160,000 in annual operating expense savings.

UPPER CANADA MALL:

Combining **$15,000+ cost savings opportunities with improvements to tenant comfort, UCM will achieve a less than 2-year payback on the Switch implementation.**

When the Switch Gateway was installed on site for the first time, the getaway was commissioned, and integrated to the existing site equipment (HVAC and sub-metering) then Switch Analytics were deployed. The Switch Analytics showed that one-third of the roof top units (RTU) were not serving the spaces correctly with respect to heating. These RTUs were feeding the food court area and not heating the space effectively putting a greater demand on other units that served the greater mall area.

A control failure from the BMS was causing cold space temperatures and lower-than-normal comfort index ratings (30% of the RTUs weren't heating spaces to programmed setpoints). Oxford engaged the local BMS vendor to repair impacted controllers which improved tenant comfort by 60%.

WATERPARK PLACE:

With 12 opportunities to optimize total building performance, WPP has achieved **$65,000+ in annual savings for a 1.2-year payback.**

Open isolation valves on the boilers was causing hot water to bypass the system, unnecessarily increasing boiler and pump energy. Significant savings were identified here as the boilers were working far harder than necessary resulting in cold space temperature and excessive energy consumption. Oxford traced the cause to a temporary control sequence inadvertently left in place during building testing and balancing (TAB). The onsite team adjusted control sequences, which alone **resulted in $41,000 annual savings in HVAC and boiler operation.**

RESULTS:

The opportunities identified in 3 short months at 2 sites is increasingly saving Oxford Properties operational costs and increasing team efficiency. The initial program learnings are now being replicated across the portfolio.

- The Switch Platform was used to conduct an initial retro commissioning (RCx) study at both buildings to look for low-cost optimization strategies that could be implemented for immediate gains.
- Bundled more complex opportunities into an action plan and developed a tailored scope of work to implement in a cost-effective manner.
- Instantly validated site work using the Switch Platform, and held vendors accountable for paid work that should result in site improvements

TESTIMONIAL:

"If this issue had occurred 10 or 20 years ago, we would never have identified it because the tenants weren't reporting any temperature discomfort. The Platform revealed it to us, so we could address it immediately." - Peter Zalewski, Senior Operations Manager, Oxford Properties

Enertiv:
ENERGY OPTIMIZATION

Enertiv
www.enertiv.com

MetaProp Portfolio company Enertive showcases how their customer gets maximum value, and save time and money, using their solution. Enertiv is a property tech company that creates hardware and software to track the performance and energy usage of building systems. The company drives net operating income (NOI) growth in commercial real estate portfolios by bringing a data-first approach to operational workflows such as maintenance and repairs, energy management, tenant billing, vendor management, and capital investments.

Enertiv helps Laramar save $75,000 a year through equipment performance tracking

CLIENT:

Over the last 30 years, Laramar has grown from a small real estate investment company to a vertically integrated, multi-billion-dollar portfolio. This growth has been fueled by a meticulous attention to detail and unwavering maintenance standards for their assets.

CHALLENGE:

However, despite the best efforts of the managers and on-site staff, equipment issues would go undetected, resulting in unnecessary damage to equipment and an increase in costs due to earlier-than-expected replacements. As importantly, because operators were largely reactive to tenant discomfort, Laramar's team was concerned that the friction could increase the chance of vacancies. To address this challenge, Laramar began evaluating solutions, including the Enertiv Platform.

SOLUTION:

Laramar selected two buildings in the Chatsworth Business Park, a 230,000 square foot office complex in Southern California, as the site for the first phase of deploying Enertiv's technology.

Enertiv installed sensors to track the performance of 43 pieces of critical equipment for a nominal one-time implementation fee and a recurring annual subscription.

As part of the standard process, the Enertiv client success team onboarded Laramar's operations team on how to use the platform with a focus on their specific goals. Within weeks, the Enertiv Platform began firing automated notifications to the on-site staff alerting them to malfunctioning equipment.

RESULTS:

The maintenance insights were coupled with a series of energy-saving optimizations that combined to
$75,000 in annual savings, a potential 440% return on the first year's cost of ownership.

In addition to notifying operators that an HVAC unit was short cycling and another was not turning on at the right time, Enertiv's client success team took a deep dive into the data in preparation for the first quarterly review. The insight review uncovered a number of optimizations that have been verified to reduce maintenance and repair costs. The client success team also identified that the temperature set point for an HVAC system was too low, accelerating wear and tear on the system by causing it to cycle on and off rapidly.

- $32,192 by Optimizing A/C Set: Points The chief engineer had raised the set point for one A/C unit to 62°F because some tenants were too cold. Enertiv's experience indicated that all 4 A/C units could be raised to 65°F without sacrificing tenant comfort.
- $13,883 by Reducing Pump Speed Through a VFD installation: In addition to suboptimal schedules, the condenser water pumps would not ramp up or down with A/C usage requirements. The Enertiv team recommended reducing pump speed by 15% with variable frequency drives (VFDs), which have been shown in other client portfolios to deliver an 18-24-month payback.
- $22,745 by Optimizing Condenser Water Pump Schedules: The schedule for the condenser water pumps for one of the two buildings was from 6:00AM–6:15PM. However, in the other building, the condenser water pumps turned on at 1:15AM, well before any tenants would occupy the office building.
- $6,045 by Optimizing A/C Schedules: Similarly to the inefficient pump schedules, Enertiv identified that multiple A/C units were turning on between 1AM–3AM

TESTIMONIALS:

"The guys at Enertiv really understand how to help us get the most out of our building with the data they collect. Their team is insightful, responsive, and we've developed a good working relationship." - Peter Noren, Chief Engineer at Laramar

"The technology and support provided by Enertiv have gone above and beyond our expectations. We're excited to see where the next phase of this partnership can take us."
- Ryan Johnson, Senior Associate at Nine Four Ventures, Laramar's Real Estate Technology Fund

Awair:
HEALTH & WELL-BEING

Awair
www.getawair.com

Indoor air quality can be five to ten times worse than outdoor air. Good outdoor air typically has CO2 at 250 to 350 parts per million. At 2,000 to 5,000 symptoms includes headaches, sleepiness, increased heart rate, and slight nausea. One of the leading companies that help improve the air we breathe indoors is Awair. It's an indoor environment management solutions company that works with businesses across the world to equip them with real-time, actionable environment data to achieve their financial, productivity and wellness goals. The company produces an Indoor Environmental Monitoring system that enables to gather and track IAQ data from millions of data points across 2,000 cities and 60 countries.

Awair tracks 7 key factors that affect air quality: chemicals, dust, CO2, humidity, light, noise and temperature. The chemicals that Awair tracks are commonly referred to as VOCs, or volatile organic compounds. It is an umbrella term used to describe any organic chemical that evaporates easily at room temperature. The VOCs detected by Awair include Formaldehyde, Methane, Ammonia, Ethanol, Carbon Monoxide, Hydrogen gas, Hydrogen sulfide, Toluene, and more. Higher levels of VOCs can include irritation of eyes and nasal passages, nausea and headaches, lethargy and malaise, rash, skin irritation, and eczema.

With advanced predictive analytics, Awair solutions help their customers, property managers and building operators make smarter data-driven decisions in real-time.

Some of their major clients are Airbnb, Hyatt, JLL, Seoul Metro, Google and Samsung. Below are two case studies that show how Awair solution helped create a healthy office environment for AirBnB's employees and how it helped the IAQ data to be gathered, monitored and managed for CRE company 4D Monitoring.

Awair for Airbnb

CLIENT:

Airbnb is an online marketplace and hospitality service brokerage company that connects people to unique travel experiences in more than 4,500,000 listings in over 65,000 cities in 192 countries. In 2011 the company became a "unicorn" valued at a billion dollars. Headquartered in San Francisco, the company has offices in Dublin, London, Barcelona, Paris, Milan, Copenhagen, Berlin, Moscow, São Paulo, Sydney, and Singapore.

As a global innovator in hospitality, one of Airbnb's core corporate values is "Be a Host"—a mantra that the Health and Safety team works to bring to life by providing an elevated work environment to Airbnb employees.

CHALLENGE:

After having to evacuate a corporate office in response to a possible rise in VOCs, the Airbnb Health and Wellness team was searching for a solution to ensure they were providing a healthy and productive environment for employees. The team needed to be able to manage employee safety across many multi-story corporate buildings around the world with varying needs and network compatibility.

SOLUTION:

The Health and Safety team decided to place Omni units in Airbnb corporate offices around the globe including San Francisco, Hong Kong, India, and more.

RESULTS:

Since December 2017, Airbnb's Health and Safety team has leveraged Awair for Business to provide a safe and productive environment for employees across the globe:

- The Awair Dashboard allows the Health and Wellness team quick access to data across multiple offices in different countries to verify healthy employee environments.
- Installed Omnis were able to alert the Health and Wellness team when an oven malfunctioned and leaked VOCs throughout a corporate building overnight. The team was able to quickly make changes to ensure the environment was safe for employees the next morning.
- The Awair team helped the Health and Wellness team create an SOP for security and maintenance staff to help quickly address any further environmental issues.
- Installed Omnis were able to identify an air purifying system that was not properly installed and the Airbnb team was able to quickly update.
- Awair for Business's flexible solutions made installing and integrating Omnis in different Airbnb offices throughout the world possible.
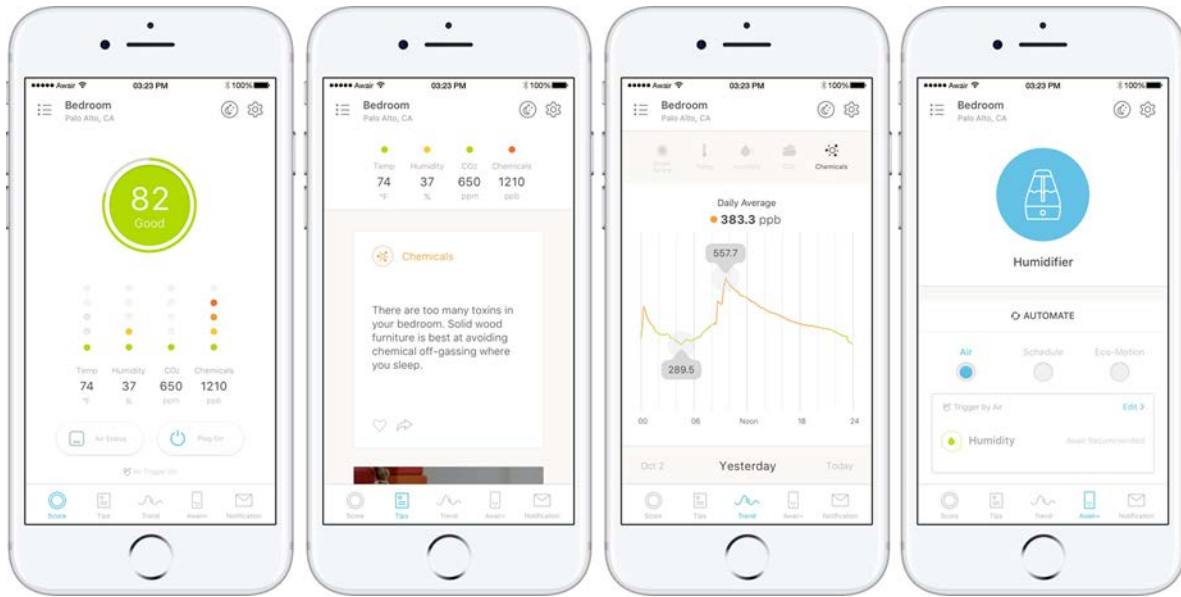
Awair for 4 Monitoring

CLIENT:

4D Monitoring is a UK based company that provides comprehensive building monitoring solutions that enable its clients to have complete visibility of their building environments, with a focus on plant and boiler rooms.

CHALLENGE:

The company provides their clients with data on energy usage, but the clients were interested in more robust IAQ data. They expressed interest in verifying their indoor air quality, but many could not afford to apply for popular certifications. In addition, they preferred monitoring solutions that make little noise and are designed to fit their aesthetic.

SOLUTION:

The 4D Monitoring team integrated Awair Omni into their services and began installing Omnis in client projects.

RESULTS:

Since February 2018, 4D Monitoring has leveraged Awair for Business to enhance its client experience.

- The Awair Dashboard and API allow 4D Monitoring to easily manage data for multiple clients at a time.
- Omni is offered to clients as a cost-effective IAQ monitoring solution that verifies their building sustainability needs at a fraction of the cost of a certification application.
- 4D Monitoring is able to expand their service, leveraging findings collected by their clients' new in-depth IAQ data to provide actionable insights and building performance reviews.

TESTIMONIAL:

"Compared to (other enterprise IAQ monitors), Omni is the best-looking and noise-free solution we can provide to our clients." - 4D Monitors

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Basking Automation:
SPACE OPTIMIZATION

Basking Automation
www.basking.io

According to smart building specialist Memoori Research, the market for occupancy analytics in office space is growing rapidly, driven by increasing office densification, poor space utilization and demand for more productive environments. The potential uses of occupancy analytics include space optimization, indoor mapping, people counting and tracking, asset tracking, scanning and visualizing indoor space, and room and desk booking.

Basking Automation is a workplace occupancy analytics platform that helps corporate real estate managers to get a detailed understanding of how their offices are being used. Basking's platform plugs into the existing WiFi infrastructure as a primary data source to provide portfolio-wide coverage within hours, making the solution affordable at a large scale while protecting employee privacy.

In 2019 Basking has won the German Property Association's Office Awards and partnered with Colliers International to provide occupancy analytics to its clients in EMEA and the US. Below is a case study of how Basking Automation evaluated the use of office space for Colliers' EMEA HQ.

Basking Automation for Colliers International

CLIENT:
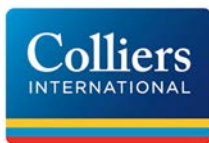
Colliers International is a leading global real estate services and investment management company with operations in 68 countries and over 14,000 employees. In 2018, Colliers International's corporate revenues were $2.8 billion ($3.3 billion including affiliates), with more than $26 billion of assets under management.

CHALLENGE:

Colliers International's EMEA HQ office in London is a 57,000 sq. ft large office space. In order to cope with the planned headcount growth in this location, the management team considered renting additional office space in adjacent buildings. Additional costs for that were estimated at €1,000 per desk monthly.

The workplace management team had the basic data on space utilization, starting with the 7% vacancy rate based on the number of unassigned desks. For a more detailed view, the manual counting was required which proved resource intensive and time consuming. So the team was looking to implement a tech solution that would provide the centralized real-time occupancy analytics, that would combine the non-intrusive counting, with high data accuracy and granularity and no CAPEX required.

SOLUTION:

Basking used its certified API integration with Cisco Meraki to connect to Colliers' WiFi network in London office. Solution was live within one day, and meaningful insights on occupancy and space utilization were provided in the 1st week of analysis.

RESULTS:

Using its machine learning algorithms, Basking has identified several optimization opportunities for Colliers, including the share of space that can be repurposed to improve the workplace conditions and the potential for 40 to 140 more people that can be allocated in the existing office. This will provide the space to accommodate additional staff without increase in footprint and up to EUR 984,000 per year in costs avoidance.

TESTIMONIAL:

"We had the opportunity to test and customize Basking's offering to add value for our clients by combining a new AI-based occupancy analytics capability with Colliers' market knowledge."

- Chris McLernon, CEO, Colliers International EMEA.

bGrid:
ENERGY & SPACE OPTIMIZATION

bGrid

www.bgridsolutions.com

Smart buildings, big data, and artificial intelligence. All buzzwords everyone has heard about and cannot wait to see it implemented in their own environment. The enthusiasm and demand is growing and more and more companies are popping up to fill in the demand in their own way and with their own proposition. One of the companies providing the backbone of your smart building is bGrid.

bGrid is a technology and innovation company based in Amsterdam. bGrid develops, markets and sells smart building products and services that use state-of-the-art communications technology, with focus on controls, remote monitoring and Internet of Things solutions. The bGrid® solution consists of multifunctional bGrid® Nodes which measure everything in your building as well providing a wireless Bluetooth positioning network. The bGrid® Nodes connect to your lighting system, building management system and more. This allows for controlling light, climate and blinds among others. The bGrid® API lets you connect every desired smart building application with ease. Creating the building as your smartphone. bGrid works in cooperation with international technology partners and universities, and executes projects for commercial real estate, education, airports, hospitals, laboratories and other buildings.

To have a better view on how to achieve efficiencies through Proptech, bGrid has highlighted two case studies from two of its customers: Rijksvastgoedbedrijf (Dutch Ministry of Infrastructure and the Environment and Central Government Real Estate Agency) and Microsoft.
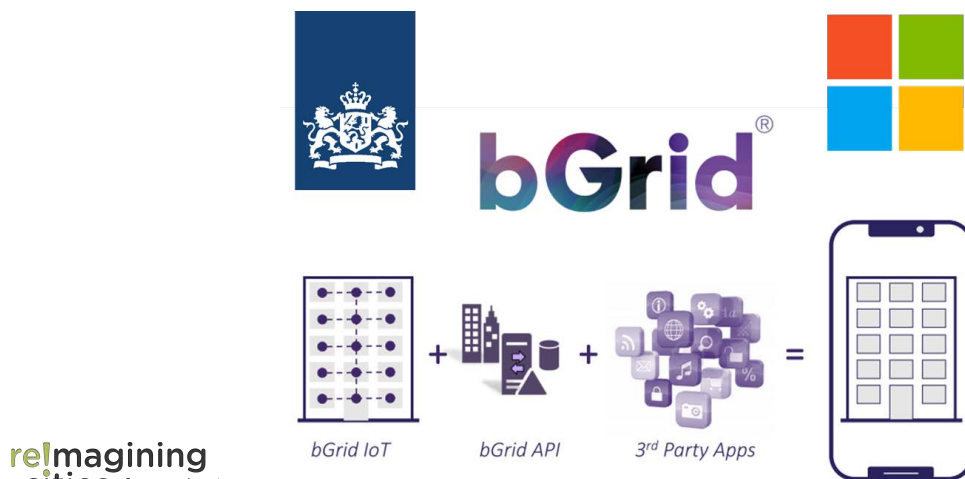
The Building as a Smartphone™

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Reducing Energy without comfort loss for Rijksvastgoedbedrijf

CLIENT:

Het Rijksvastgoedbedrijf (RVB) is the Dutch government agency responsible for all real estate of the Dutch government. The RVB has a broad range of real estate ranging from ministries and office buildings to prisons and military bases. They are responsible for all activities throughout the life span of a property; starting with new build, maintenance and eventually redevelopment. With such a vast and diverse portfolio, the RVB is always looking for ways to use their existing property more efficiently and to reduce operational costs without affecting user-experience.

The RWS-building in Rijswijk, the Netherlands, is an office build in 2015 and used by the Dutch Ministry of Infrastructure and Environment. To facilitate the optimal use of the Rijswijk RWS building, RVB has chosen to make the building smarter by means of installing the bGrid® solution. With the bGrid® solution and a mobile application supplied by a bGrid partner, the RVB is monitoring the environmental conditions and desk and area occupancy so RWS employees can easily find an available desk and office space. To further optimize on exploitation cost, RVB initiated a case study with the Technical University of Eindhoven (TU/e) to investigate the possibility of reducing energy costs.
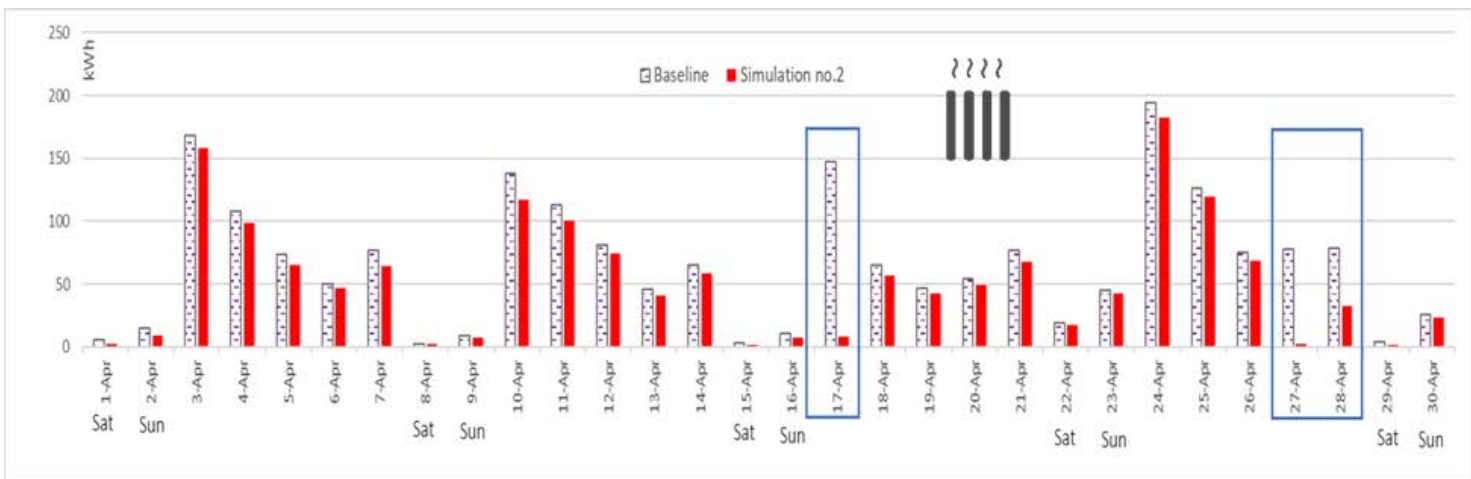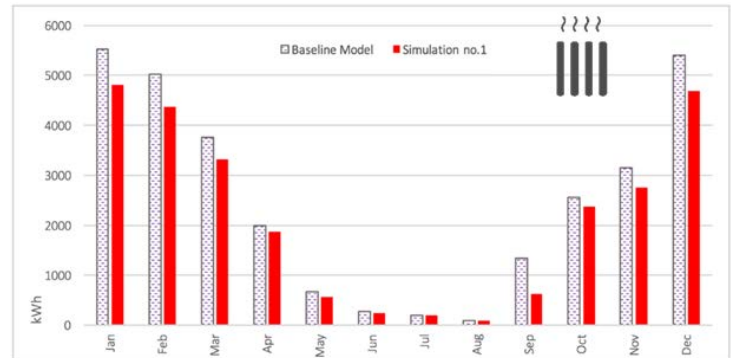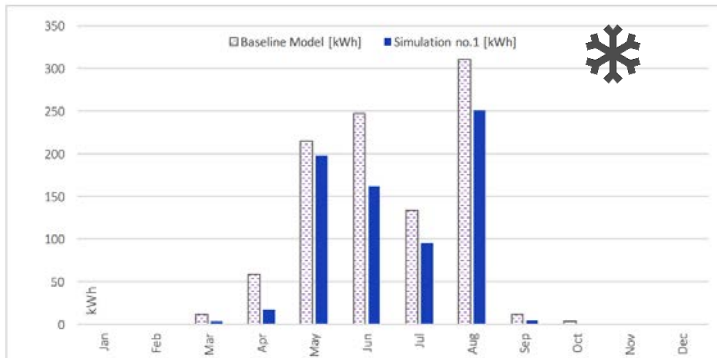

SOLUTION:

The climatization in the RWS building is a fixed time-based climate schedule, common to most office buildings. To manage a reduction of the energy costs, the TU/e investigated if it was possible to change this to predictive climatization or a Dynamic Climate System based on the actual building usage. Using the historical usage data from the bGrid® system, TU/e constructed a model which made it possible to predict the annual savings on energy using different climatization scenarios.

RESULTS:

The model made by TU/e showed that for the RWS building 14% to 20% can be saved on heating costs and 26% on cooling. Meaning that by using a Dynamic Climate System major savings can be achieved without the loss of comfort. Another research also showed that on top of the climatization savings, RVB could save 26% on lighting*. The total energy cost for the RWS-building in 2017 where 217.000 Euro or 30 Euro/m2. Translating these figures to the RWS building it would mean that RVB could achieve:

- An annual saving of 22.000 Euro on climatization
- An annual saving of 18.000 Euro on lighting
- A total annual saving of 40.000 Euro or 5,5 Euro/m2
- An increase in the asset value of the RWS-building by 240.000 Euro or 35 Euro/m2*

Research done by the Lighting Controls Association
Incorporating annual costs of solution and 12-year value

Saving floor space in the Outlook building of Microsoft

CLIENT:

Microsoft is an American multinational technology company with headquarters in Redmond, Washington and offices throughout the world. In the Netherlands their primary office is in the building called 'The Outlook' located at Schiphol Airport near Amsterdam. In 2018 the building interior was completely renovated with spaces that are designed and arranged in such a way that it provides building users with an optimal working experience.

To increase this experience a smart building network was required together with areas for concentration, relaxation, telecommunication, meetings and of course flexible working. Microsoft wanted to use smart technology to facilitate and improve both the employee- and the visitor experience. From the moment people set off to come to The Outlook and park, to receiving guests, being able to work comfortably and host a meeting, through to their departure. To realize this open and intelligent office environment, Microsoft wanted to have insight into the actual usage & occupancy of the building before remodeling to be able to optimize the design.

SOLUTION:

To answer both the question of insight prior to remodeling and to provide a smart building infrastructure, the bGrid® solution was implemented in two phases. In phase one a temporary setup was created intended to map building usage and environmental parameters; no connection was made to existing building management systems. During the renovation, phase two started where the bGrid® solutions was fully integrated within the complete building making connections to the (new) building systems. This made it possible to control light and temperature (automatically and by the users) and increase the personal comfort.
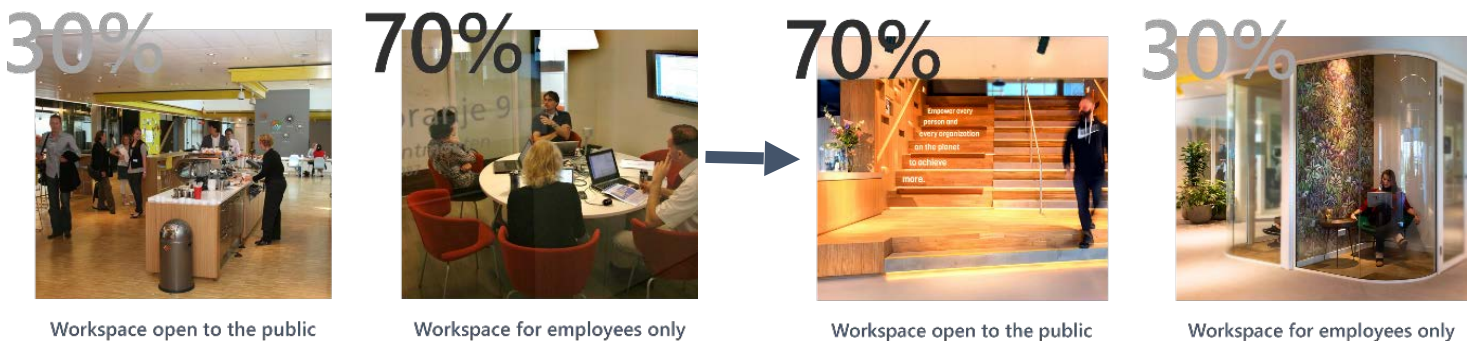
RESULTS:

With the occupancy information gathered at phase 1, Microsoft decided to decrease the amount of floorspace for its new building. They reduced their floor space from 12.000 to 8.000 m2, resulting in an annual saving of about 1,4 Million Euro. This can have an impact on the balance sheet of 10,8 Million Euro as displayed in the Table below. The leftover space in the building was transferred to Spaces, a company specializing in Office as a Service Solutions. As the bGrid® solution was rolled out throughout the entire Outlook building, Spaces also uses the Smart Building capability to offer an attractive and modern office. Furthermore, Microsoft decided to create more workspace open to the public and less workspace for employees only.

In phase 2 the personal comfort of the building went up by environment control based on real-time measurements and by user preferences. Also, the usage of all chosen areas (areas for concentration, relaxation, telecommunication, meetings and of course flexible working) are monitored to be used for potential adaptions during their rental contract. With the optimized building Microsoft noticed an increase in health and focus of its employees and more people who wanted to join the company and work in the smart building.

GFA	Lease	Yearly Lease	DCF for 10 Year Lease
12.000 m²	350 €/m²/year	4.200.000 €/Year	32.431.286 €
8.000 m²	350 €/m²/year	2.800.000 €/Year	21.620.857 €

Workspace open to the public

Workspace for employees only

Workspace open to the public

Workspace for employees only

The Outlook: From the new world of working with 11.500m2 for 700 employees (at opening) and 30% workspace open to the public and 70% workspace for employees only. To a workplace transformation (work smarter not harder) with 8.500m2 for 1000 employees and 70% workspace open to the public and 30% workspace for employees only.

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By Re!magining Cities Foundation, 2019

Chungha Cha, *Co-Founder & Chair*
Tsatsral Baatar, *Global Proptech Research*

Re!magining Cities was established as a non-profit think tank to research global trends in smart sustainable cities and to help cities develop smart city strategies to spur economic growth based on tech and big data. With a strong background in finance, we hope to attract private investors into well-structured "public-private partnerships" and finance the rapid development of smart, sustainable communities around the world. We are especially focused on the deployment of "Digital Twins" as one of the key enablers of leveraging technology and big data analytics to provide a higher quality of life for citizens. Together with global collaboration partners, we strive for carbon neutral cities and circular economies:

- Smart Cities Council, Washington DC
- WeGO Smart Sustainable Cities Organization
- ASEAN Smart Cities Network
- Global Real Estate Sustainability Benchmark (GRESB) in Asia, Sydney
- MIPIM Proptech, Paris.

By working closely with cities, developers, proptech solution providers and global investors, we can demonstrate together that "smarter and greener" communities can be developed at attractive investment returns for people, planet and inclusive prosperity.

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