Schiphol Smart Building 2030

A shared vision for Smart Building:
towards a Schiphol AirportCity

Your office at Amsterdam Airport

Schiphol

Introduction

A fundamental change is underway around the runways of Schiphol. In recent decades, airports have become more than just hubs for airlines and passengers. Schiphol, once reserved solely for planes, is now a multimodal transportation hub that includes business areas, cargo centres, retail hubs and more. The Royal Schiphol Group has the objective of connecting the world by creating the world's most sustainable and high-quality airports, and Schiphol Real Estate plays a key role in these new services as part of the Royal Schiphol Group. As increasing numbers of businesses move to the Schiphol area, Schiphol Real Estate is making the area smarter and more efficient for everyone, with the ultimate goal of becoming an AirportCity.

The concept of the Smart Building is crucial to the wider Schiphol AirportCity. For Schiphol Real Estate (SRE), the Smart Building means more than just using the latest technologies to create smart features within a building. It means that systems and devices are connected, both within buildings and *between* buildings, in order to meet the immediate and ongoing needs of the occupants.

This paper has been written by Schiphol Real Estate and contributes to the three overarching objectives of the Royal Schiphol Group: quality of network, quality of life and quality of services. At Schiphol Real Estate, we want to introduce the Smart Building concept to anyone interested in being part of Schiphol's Smart Building ecosystem.

This is our attempt to reach out to new partners, to demonstrate what it means to be a tenant in a Schiphol Smart Building, and to update stakeholders about the 'smart' approach. This paper will also explore the topics listed below, each in its own section.

1. **Schiphol Real Estate's strategic pillars** – flexibility, well-being, connection and inspiration; the Smart Building concepts to all of these, as a strategy enabler.
2. **The target group served by the Smart Building concept,** from the operational and management perspectives, which leads to our definition of the Smart Building.
3. **The capabilities, themes and initiatives** through which the Smart Building concept drives strategic value including digital productivity, the utilisation of space, safety and security, physical workplace services, asset management, and building service management.
4. **The Schiphol platform for smart buildings**, explained from a framework perspective, which clarifies how we store, visualise and share data among different stakeholders.
5. **The Smart Building roadmap** for Schiphol Real Estate towards 2030.
6. **The partnering approach from multiple perspectives** in the smart building journey to enhance well-being, add flexibility, foster connections and create the inspiring Schiphol AirportCity.

1

Schiphol Real Estate's strategic pillars

In recent years, Schiphol has expanded from its core business of aviation and commercial services and established Schiphol Real Estate to provide services for local businesses, conference services, and property management for companies and local communities. Of Schiphol's 670,000 m^2 real estate portfolio, over 200,000 m^2 is dedicated to office space, mainly in the area of Schiphol Central Business District and Schiphol-Oost. The demand for office space continues to grow, as does Schiphol Real Estate's business portfolio.

Schiphol Real Estate aims to create a working environment that facilitates, but also surprises and inspires all users. We refer to these users as our 'residents' and we are in a constant dialogue with them so that we can actively respond to their wishes and add value. We do this by applying smart and sustainable technologies that provide better insight into their usage. On the one hand, this enables residents to make even better use of their real estate, while on the other hand, we can use this information to manage our locations more effectively. This makes Schiphol AirportCity a uniquely appealing location.

1.1 Four strategic pillars

We have identified four strategic pillars that contribute to Schiphol's quality of network, quality of life and quality of services. These pillars are explained in more detail below. Smart technology plays a role in each of these pillars.

1.1.1. Flexibility: Solutions that scale with you

These days, adaptability is essential in any organisation. Markets change quickly, and so it is important for us to move proactively. We do this by providing real estate solutions that are flexible in terms of both duration and surface area, and by looking further than just a single office building. Understanding the latest needs and preferences is key, and we use data to introduce new service offerings. This can include software and remote services such as smart locks, new or adjusted business models such as Space-as-a-Service or Data-as-a-Service, so that we can cater to the needs of tenants and add value to the entire area. Realtime data feeds from parking systems, for example, may enable a move away from the current system of parking subscriptions towards a more flexible approach based on actual utilisation. The same could be done with building management systems regarding desks or meeting rooms. Both of these examples involve taking advantage of flexibility and sharing. We offer flexibility throughout the area.

1.1.2. Well-being: An eye for people, company and planet

In our vision, it is important that everyone contributes to the balance between the well-being of companies, employees and our planet. Our well-being objectives guide the way in which we manage our real estate and areas. Making our real estate portfolio more sustainable is an ongoing process that we are working on by reducing energy consumption and introducing circular construction methods. We design and develop buildings that interact with their environment through smart building technology. Our goal is to reduce our carbon footprint and energy usage while providing the best possible user experience. Your individual health is also a priority for us, which is why we are investing in technologies that improve the well-being of all residents in our buildings by providing pleasant and productive workplaces.

Given that most of us spend over 90% of our time indoors, a pleasant and safe indoor environment with good air quality, low noise levels, and adaptive systems is essential for our health and productivity. These days, well-being is becoming one of the most important factors for both employers and employees. A Smart Building uses all kind of modern sensors and systems to monitor and maintain a healthy indoor environment so that users feel comfortable, safe, and productive. In addition to monitoring the indoor environment, it also advises users on their daily routine, such as their water or food consumption and when to use the stairs instead of the lift.

1.1.3. Creating Connections: A community that grows companies and their people

The Schiphol area connects people, and those connections lead to new opportunities, new insights and new partnerships. At the centre of this is our community platform Spot, which facilitates meetings, knowledge sharing and personal development, including an annual TEDx event, workshops, sports activities and drinks. This is how we are creating an AirportCity that invites you to connect with each other. An environment with a special mix of companies and employees who meet and inspire each other through a multitude of online and offline events.

1.1.4. Inspiration: An inspiring working environment that works for people

A successful working environment makes people feel comfortable and inspired. Schiphol AirportCity, with its vibrant 24/7 energy, offers that dynamic environment. We know that the boundary between work and the rest of our lives is becoming increasingly blurred and that preferences in the working environment are changing as a result. For that reason, you will find all kinds of useful facilities within our buildings. This includes childcare, supermarkets, coffee shops, restaurants and fitness clubs, boosting the productivity and creativity of people and companies.

Our smart buildings let us know exactly what residents need at specific points throughout their interactive journey within a building. Residents will experience the smoothness and smartness of the building as it adjusts to their needs and provides just the right information – without them even needing to ask for it. Temperature, lighting, furniture, and devices will regulate themselves based on the behaviour of the person or team using the space, creating a personalised environment and a seamless experience. Creating a five-star experience will increase productivity and lead to higher user satisfaction, loyalty, and net promotor score.

1.2 Revenues and cost

In addition to the four strategic pillars, a focus on costs and revenues is important to operate and develop our area. Up to 75% of a building's lifetime cost is spent on operations and maintenance (Aravind Kumar, 2019). Smart Building concepts allow us to predict what a certain asset needs and when it will need it.

By monitoring current statuses and degradation patterns in, for example, energy consumption, it becomes possible to determine the best possible timing for maintenance based on actual needs. This minimises downtime and inconvenience, and enables more efficient planning. Data-driven advance planning reduces costs for all stakeholders. We align knowledge and needs, which brings benefits throughout the entire technical lifecycle. Data gathered from IoT sensors also helps building owners, facility managers, and users to make better decisions in terms of energy usage, space utilisation and occupancy, provides new or flexible business models, and so on.

Together, these four strategic pillars form the basis for all our activities, and they are all powered by smart technologies to some extent. But what are these technologies and what do we mean by Smart Buildings? The next section explains this definition and the subsequent sections will shed light on all the possibilities that Smart Buildings can bring.

powered by smart technologies

2

Smart Building: use and management

The previous sections have introduced the Schiphol area and the strategic pillars of Schiphol Real Estate. All the pillars are powered to some degree by smart technologies, but what does that mean in practice? This section will firstly define the concept of the Smart Building, before we go to explain what Smart Buildings can do for you in the next section.

As we have explained, Schiphol Real Estate is aiming to create a flexible working environment that facilitates, but also surprises and inspires all users. And all of this while also taking the well-being of users into account. Achieving these goals is more challenging than it may appear. The following sections will clarify these challenges from two perspectives, namely a tenants' operational facility management perspective and a real estate owners' managing perspective. Together these two perspectives lead us to our Smart Building definition.

2.1 Operational and building management perspectives

In recent decades, buildings have been equipped with all kind of technologies, like HVAC systems, cooling systems, heating systems, lighting systems, and so on. These technologies have got better and better over time but they mainly operate in isolation from one another. For example, lights turn themselves on as soon as you walk into a room and HVAC systems have different settings for working days and weekends. At present, most of these systems are not connected with each other, leading to inefficiencies and waste. Our approach to the Smart Building covers both these two perspectives and goes further than just connecting the systems to each other.

2.1.1 The operational perspective of the Smart Building concept

At Schiphol Real Estate, we are raising our standards, project after project, in order to provide the best possible working environment. Our Smart Building approach is a continuation of this philosophy, combining technologies that interact with each other in a smart way. Imagine that a building 'knows' how and when people are using it – everything from the overall occupancy rate to the use of individual meeting rooms.

It knows which areas need to be cleaned and how many people will be using the restaurant. It can adapt quickly and easily to both internal and external circumstances. It can guide each one of its users to free spaces when they want to work, eat or meet. And it can be equipped with all kind of desk utilisation sensors or room reservation systems that also help to improve users' well-being. And all of this in order to create an environment in which you can be even more comfortable and productive than you already are. That's when you can achieve the maximum operating potential of your building. But what does it mean for managing the building?

2.1.2 The management perspective of the Smart Building

As soon as we start linking HVAC systems, cooling systems, heating systems, lighting systems, and so on, it becomes possible to share data and generate insights that we have never seen before. These insights can help to create a much deeper understanding of how the building is used, sometimes without the need for any human intervention. Imagine that we could monitor technical conditions and air quality by automatically adjusting thresholds based on the conditions outside.

Or that we could monitor a building's energy consumption in detail and eliminate all unnecessary energy consumption. And that we could use weather forecast data to predict the amount of cooling or heating energy needed on a specific day. That we could free up power reserves, possibly in combination with sustainable power sources, to charge an even larger number of electric vehicles (cars, bikes, etc.) with the same infrastructure. And that we could create an automated synchronised flow within systems to which we could add even more systems, like facility management

systems, maintenance systems and financial systems. This would enable us to see and respond to changing circumstances. We would know exactly how a specific component or asset is being used and when it needs to be serviced or replaced. That's how you can achieve maximum efficiency in building management.

2.2 Definition of the Smart Building concept

By generating useful and usable data, we can provide an even higher level of service and utilise the building and spaces within the building more efficiently than today, enabling the overall experience of the building to exceed expectations. This gives us the following definition:

A Smart Building is a dynamic and intelligent system that consists of both hardware and software. It uses data and AI to responds to the immediate and ongoing needs of its occupants and contributes to the long-term goals of its owners.

All in all, a smart building serves a broad variety of stakeholders and, as shown in previous examples, its strength lies in the combination of connections and data, sorted by usage case. But, how will we know where to add value? And which usage cases to select? The next section will answer these questions.

3

The Smart Building: What capabilities does it have?

The previous sections introduced our definition of the Smart Building and who it can benefit. This part of the paper explains how we can categorise all smart building capabilities from a portfolio perspective. We can use these capabilities to track our activities and thereby manage our innovation portfolio. This also helps us to focus on specific needs or research areas to improve the overall experience. A single Smart Building capability also has multiple themes to which one or multiple (backlog) initiatives can belong. This section clarifies all the capabilities, themes, and initiatives and shows how they link up with the strategic pillars described previously.

To begin with, we have based the following six Smart Building capabilities on Microsofts' studies (J.A. Ondiviela, 2019) and customized them to fit within the scope of Schiphol Real Estate in the following areas: **Digital productivity (3.1), Space utilisation (3.2), Safety and security (3.3), Physical workplace services (3.4), Asset management (3.5)** and **Building services management (3.6).** These capabilities are explained below:

3.1 Digital productivity

Make technology work for residents in the most efficient manner possible. Schiphol's current themes include indoor navigation, wayfinding and virtual assistants that help users to find their way around a building. Initiatives in this area include Alexa for business to control the climate and Mapiq to find colleagues and work spots.

3.2 Space utilisation

How do we get the best out of the space available in a building? Space utilisation is becoming more important and there is an increasing demand for data on density per square meter for a range of purposes. As well as optimising the occupancy of existing rented offices, our flexible approach like Spacemaker, Spaces, and The Office Operators also provides the option of renting meeting rooms and work places in a building. We are also using all sorts of IoT initiatives to analyse and optimise workplace occupancy, meeting room utilisation, and the usage of parking facilities in order to get the most out of the working environment.

3.3 Safety and security

Ensure the safety of people and assets in and around the building, including both physical security and cybersecurity. For example, it is important to SRE that our Smart Buildings operate in a secure environment that protects them from 'hacktivism' and other types of cyberattacks. This is regularly checked using Penetration Testing. On the other hand, it has also been vital to keep users safe and secure during the recent pandemic, for example, or to protect them from stress in the workplace. We use data gathered from IoT sensors and Building Management Systems to inform our users, without compromising their privacy.

3.4 Physical workplace services

Provide an improved physical environment for the workplace. Schiphol supports mobility for its residents and visitors to the area through car-sharing and bike-sharing initiatives as a service and provides an on-demand cleaning service for its tenants using smart feedback mechanisms.

3.5 Asset management

Transition from a reactive approach to asset management to a proactive approach. Automate fault detection, mandatory processes, maintenance, and the lifecycle of building assets. Our buildings are equipped with asset management systems that automate asset defect reporting, carry out compliance checks and optimise maintenance schedules for building operators. Lighting and climate assets are automatically adjusted to meet the needs of residents. The system also includes a 'materials passport' to improve asset recyclability.

3.6 Building services management

Smart building services management optimises energy and water usage, waste separation, connectivity services, facility services, and so on. Schiphol's building management systems improve the efficiency of energy and water consumption through smart energy contracts, energy-balancing systems and usage optimisers. Initiatives in waste management have been launched to encourage waste separation and improve waste disposal schedules. These initiatives are contributing to a lower carbon footprint. Connectivity is key and so SRE is also constantly improving the coverage of the mobile networks and preparing for 5G.

Together, the six capabilities described above are bundled in the management of our innovation portfolio. The portfolio overview on the next page lists all the capabilities, themes and initiatives that SRE has implemented or has in the pipeline. It also shows which strategic pillars the initiatives contribute to, although in some cases this is more than one pillar. We collaborate with partners and clients continuously in order to come up with new initiatives in all themes and enhance our portfolio. These initiatives are researched and tested, and it is our intention to share lessons learned with the partners in our network.

See the next page for the Smart Building Capabilities, Themes & Initiatives diagram.

strategic innovations

Smart Building Capabilities, Themes & Initiatives

3.1 Digital Productivity

Pag. 11

Meeting JumpStart

Conferencing and Telepresence

Presence Services

Place and People Finding

- Mapiq application
- SPOT community app

Direct Indoor Navigation

- BlooLoc indoor navigation

Virtual Assistent

- Alexa for business

Ambient Intelligence

Organizational Analytics

3.2 Space Utilization

Pag. 11

Office Hospitality

Space Utilization Analysis

- Spacemaker
- Smart occupancy via BMS
- Smart meeting room occupancy
- IoTSpot workspot occupancy

Vehicle Parking

- ParkAssist parking navigation
- Find my parking spot
- Park flex (facility management)
- Just in Time Trucking (JITT)

3.3 Safety and Security

Pag. 12

Video Surveillance

Acces Control

- Physical Instruction Detection
- Fire Detection and Alarm

Digital Security

- Cyber Security

Accessibility

- Smart locks

3.4 Physical Work-place Services

Pag. 12

Smart Lobby

Physical Document Services

Shipping and Receiving

Transportation

- Car Sharing
- Bike Sharing

Catering and Vending

Cleaning Management

- Advanced scheduled cleaning
- FeedbackNow within toilets

3.5 Asset Management

Pag. 12

Fault Detection and Diagnosis

- Automated corrective maintainance

Predictive Maintenance

- Predictive maintainance elevators
- Smart compliance liability

Monitoring and control

- Healthy office tooling
- Disruptive Technologies sensoring
- Fine dust insights
- Solar panel insights

Building Automation

- Smart climate control
- Simaxx, BMS and uHoo sensoring
- Signify lighting

Asset Life-cycle Management

- Material passports portfolio

3.6 Building Services Management

Pag. 13

Energy management

- Cloud Energy Optimizer
- Sustainable green contracts
- Sustainability dashboard

Predictive Energy

- Load balancing EV stations
- Bi-directional EV charging stations

Water Management

- Water management

Waste Management

- Insights in waste

Voice and Data Connectivity

- Mobiel indoor netwerk CBD

Flexibility · Well-being · Connection · Inspiration

4

The Smart Building: How to derive the benefit from it

Having seen what the Smart Building concept means, what value it creates, which capabilities it has and how these relate to each other, we will now turn to the questions of what we need to do in order to facilitate Smart Buildings and what role Schiphol and SRE can play in this.

Our location at the airport and ownership of all building-related assets mean that there is huge potential to create a seamless customer journey for all stakeholders. Current market trends include a range of vertical-integration solutions, such as climate-optimisation tools, energy-monitoring platforms, and parking solutions. But why not try to integrate all those themes together and let them interact with each other? Sharing both building and area insights provides unique opportunities to add value to all our smart building values and the strategic SRE pillars. But in order to do this, which steps need to be taken and what can be expected?

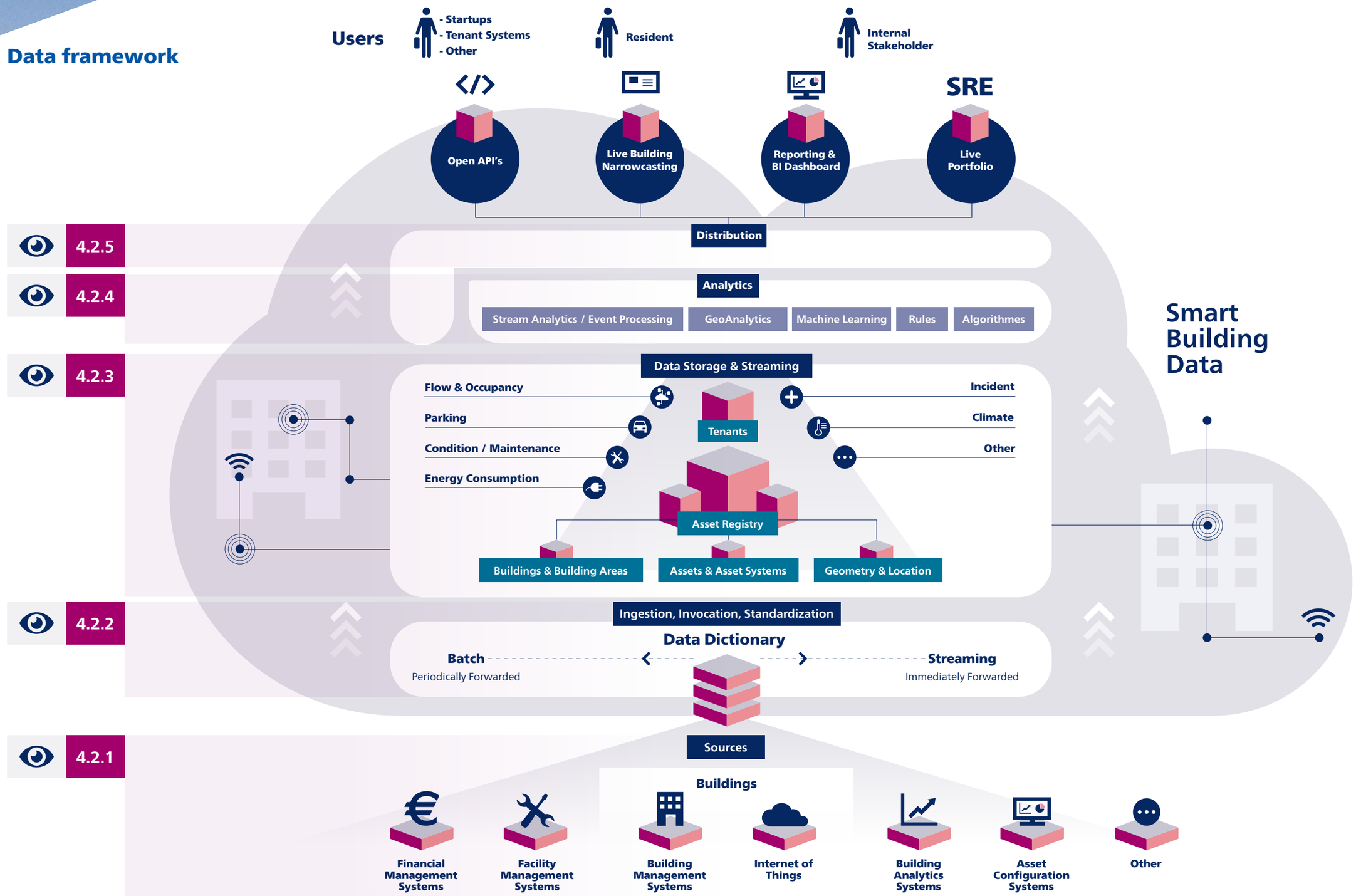
4.1 The data-driven mindset

First of all, a data-driven mindset needs to be the starting point in this process. The digital transformation is about people working with technology but not being dependent on it. All our assets can be a source of data, but in order to benefit from the potential of that data you need to be aware of its presence and the solutions that it could provide. Having clear needs and identifying potential bottlenecks helps to provide a focus. Here, people can make the difference. Alternatively, data can also be collected as a data dump and searched for correlations in underlying relationships or patterns, which could help to optimise usage, for example. Our role is to encourage this mindset and foster new ideas.

4.2 Data framework

Secondly, after identifying which data sources are needed, you also need a structured Smart Building framework that can store, process, visualise and distribute data to benefit from it. Schiphol provides this framework and infrastructure to benefit from the full potential of the Smart Building concept. The Schiphol data platform plays a strategic role here, providing all the functions required to succeed. The next part of this section explains every part of that framework in more general terms, and visualises how these link up in the figure on the next page.

Data framework



4.2.1 Generating data

Data is generated across the SRE portfolio and by its partners. A building can generate data directly in two ways: through its Building Management System, which controls technical functions, or by using new Internet of Things devices. Facility management systems and financial systems serve as additional data sources to provide insights into tenant satisfaction or utilisation. Our asset configuration systems make sure that every asset is labelled in a standardised way so that we can share the asset's status and location both internally and externally (e.g. for maintenance purposes). We cannot create all these insights ourselves and will use Smart Building analytics systems to add specific data to our assets domain. The data is analysed in our Schiphol data platform and can be shared over our standardised connections.

4.2.2 Ingestion and validation

Data has no direct value if it cannot be utilised. Schiphol's data platform ingests, validates and processes data through scalable Business Intelligence and Artificial Intelligence models using a standardised ontology and data dictionary. By doing this, we create a standard data labelling language for all our assets. For example, measurements of room temperature and CO_2 levels need to be standardised so that they can be compared within a building and between buildings.

4.2.3 Data storage and streaming

After the data has been ingested, invocated and standardised, it can be directly streamed or stored. Examples of data types include tenant information, location and geometric data, data on assets and asset systems, and data on buildings and building areas.
Some data will be shared and presented without being stored permanently if this is not necessary or desirable. The latest GDPR, legal and cyber security standards will naturally be respected.

4.2.4 Data analytics

The data journey uses various tools to translate raw data into valuable knowledge. We use complex event processing and geo-analytics for location-based information sharing and alerts. We are also developing artificial intelligence and machine learning tools, business rules, and business intelligence and data warehousing technologies to transform global data into structured knowledge.

4.2.5 Data distribution and presentation

Various data formats (analysed data, stored data and streamed data) are distributed and presented to occupants, tenants, internal stakeholders and partners who need information to improve a building's performance or usage.
To enable these activities, we have identified four ways to present data.

- Reporting and Business Intelligence dashboard: Operational tools that present analytics visually and utilise data resources to build stories for specific (business) cases.

- Live portfolio: A live overview of portfolio data that provides building management insights. It reflects activities within the real estate portfolio. For example, it can show the current asset performance of a parking lot.

collecting and sharing data

- Open API's: Creating open Application Programming Interfaces and making these available in a Schiphol API suite from which partners can use the data we have gathered in a standardised way to build applications or insights. The data will then also be available to all our tenants.

- Smart Building narrowcasting: Information kiosks that communicate some data (e.g. temperature, layout and occupancy of the building) to building users throughout the user journey to raise awareness of the overall smart building experience. Visitors can make use of the information to make conscious choices on where to work, for instance.

Now that we have explained the technical framework for working with data, the next section will shed light on which activities SRE will entail from a roadmap perspective. The framework described above is one step, but knowing what we need to build on top of that is the next step.

5

Smart Building: Our roadmap towards 2030

The previous section described the organisational steps required from a technical perspective and touched on the data-driven mindset that is needed in order to work with smart technologies. Having all technologies in place is one thing, but knowing what to do with them and what to expect from them is also vital. This section describes the steps to be taken in the years ahead, up to 2030.

Having a clear roadmap with timestamps is challenging with this kind of digital innovation. Priorities are brought into focus through the experiences of users (UX) and user interactions (UI). Together, these determine which data sources need to be used in a value-driven approach. However, we do know to which data sources we will need to connect in the upcoming years, and these are listed in the roadmap see table on the right.

Many of the actions and activities set out above will start today but never truly be finished because technology evolves and insights can change over time. As mentioned previously, periodisation changes over time and will be determined by UX and UI from the stakeholders involved. However, the strength and uniqueness of this system is that it connects as many systems as possible, so that research and data science can be used to maximise the potential.

So far, this paper has set out our internal approach and capabilities for the Smart Building concept up to 2030. However, we cannot do this by ourselves and we will need all kinds of partnerships to make it work. The next section explains our partnering approach in relation to smart buildings and possible initiatives.

		Roadmap activity	Years										
			20	21	22	23	24	25	26	27	28	29	30
Data ingestion	1	Having a solid Schiphol data backbone infrastructure that enables all future data connections and insights based on the presented framework.	■										
	2	Aligning all building management systems towards our Schiphol Cloud location to understand current needs and usages.	■	■	■								
	3	Replace current (local) data storage environments by a standardized Schiphol cloud location.	■										
	4	Connect financial and administrative systems like Yardi to the Schiphol cloud platform to tailor insights towards specific tenants.	■	■									
	5	Add other important assets systems like fire detection and parking systems towards the Schiphol cloud, based on user needs or needed insights.	■	■	■	■	■	■	■	■	■	■	■
	6	Connect to Kadaster and BAG API's so that we can use explicit detailed building information.		■	■	■							
	7	Connect to the Schiphol Geo Information System and building models (BIM).		■	■	■	■	■	■				
	8	Standardize asset labeling conform for example Haystack or Brick Schema.					■	■	■				
	9	Create an asset registration tool that secures asset history, mutations and synchronizes between main-contractors, facility management, portfolio management and Fortrus			■	■	■						
	10	Connect towards detailed weather forecast systems to analyze energy consumption and predict a building's needs.		■	■								
	11	Connect new type of IoT sensors to the Schiphol cloud like the particulate matter or people count sensors, based on use cases.	■	■	■	■	■	■	■	■	■	■	■
	12	Connect to a CRM system to understand needs and behavior.				■	■	■					
	13	Involving data scientist to analyze datasets in order to search for (unexpected) correlations.			■	■	■	■	■	■	■	■	■
	14	Start building smart grids out of multiple buildings that contribute to the strategic SRE pillars and facilitate throughout your journey.				■	■	■	■	■	■	■	■
Data presentation	15	Create a frond-end facility dashboard that helps and informs tenants with all their desired information and report functionalities.	■	■	■	■	■	■	■	■	■	■	■
	16	Share data among our tenants per use case via standardized Schiphol API's		■	■	■	■	■	■	■	■	■	■
	17	Create additional narrowcasting information that informs residents about buildings and usage to boost the overall Smart Building experience.		■	■	■	■	■	■	■	■	■	■

6

Smart Building: The ongoing partnering journey

The previous sections shared our vision on how to create smart buildings at Schiphol and the roadmap revealed many interconnections with all kinds of systems. Combining forces, both as a tenant and a supplier, is the key to success and having the right partnering mindset will help to utilise market potential and capabilities.

There are many ways to partner and our aim is to encourage the development of as many initiatives as possible through our secured Schiphol framework. It is important to connect frontend users (tenants and residents) to backend providers in an easy, standardised and accessible way for start-ups, industry leaders and other potential partners.

An effective partnering strategy will rely on shared goals regarding a common customer. To create an equal playing field, we all need to agree on governance principles right from the outset. This includes Data Protocols and Managed Dataset Agreements, Privacy Risk Assessments, Business Impact Analyses and aligning cyber-security standards. Our goal is to serve our residents collectively and, together, to strengthen Schiphol's Smart Building capabilities by providing guidelines throughout our area in a safe and secure way.

The following examples show how we can make partnerships work from a technical and non-technical perspective.

Partnership: Application builder as a partner

When an application builder is hired by a tenant, it is in both parties' interests to make the partnership work. It is in Schiphol's interest for the tenants to have the best experience with that application both inside the building and in the surrounding area.

To make this work, Schiphol will provide a series of API data connections to Schiphol Data Hub that will be necessary for the app builder to deliver value to its tenants.

This process will benefit the app builder, too, allowing it to develop more functionalities (thus also providing a better tool for tenants) and also market further capabilities to other companies. Such a partnership will increase the overall reputation of SRE's business, making both its services and its location more attractive.

Partnership: Facility management as a partner

The complexity of smart Building infrastructure will increase, involving network sensors, smart devices and control systems, wired and wireless networks, and many other components. In this scenario, the division between the responsibilities of a tenant's Facility Management and Schiphol Real Estate as a landlord will become increasingly blurred. These departments, which have until now had different roles, will need to engage with each other's work to integrate building systems successfully.

Creating an integrated system means thinking holistically about various aspects, such as space utilisation, energy usage, saving water, minimising waste and maximising reuse, promoting health and well-being within the buildings, keeping the environment green, creating resilient and flexible structures and connecting communities.

These activities inevitably involve both the field of action of facility managers and real estate property managers, with boundaries that are difficult to define. However, this should not be seen as a limitation, since what facility managers achieve in terms of information will also be useful to property managers and vice versa.

These partnership cases described above are just two examples and we could add so many more potential partnerships. The most important factor in this is that we are keen to share and develop from a user perspective, and we would like to challenge you to be a part of these exciting developments.

Conclusion

This paper has demonstrated that Schiphol Real Estate strives to forfill a leading role in the vision and development of the Smart Building concept. The Smart Building concept serves strategic values by increasing well-being, enabling flexibility, fostering connections and creating an inspiring Schiphol AirportCity. They also serve two perspectives: the operational perspective and the management perspective, which have different requirements that can be reconciled through the use of data.

The capabilities of the Smart Building show how we are setting a course for our future activities and for managing our innovation portfolio. They are driving strategic value across six different capabilities, namely: digital productivity, space utilisation, safety and security, physical workplace services, asset management, and building service management. Although a large number of initiatives within the themes and capabilities have already been accomplished, we continue to look for new challenges and solutions for our tenants and new technologies that can add connectivity and smart features.

Harnessing the power of data requires a solid data framework. The Schiphol Smart Building platform forms the backbone that can store, visualise and share data between different stakeholders. This approach also connects the various frontend and backend users in a standardised way, enabling Smart Technology adoption throughout the Schiphol area.

But we cannot achieve this alone.

Our roadmap has highlighted numerous areas of interest and we invite all readers to be part of the future of Schiphol's Smart Building concept by providing your usage case. Together, we will realise the best possible experience for people, explore the opportunities of data and technology, and define a new standard for Schiphol AirportCity.

Would you like to know more about the development of the Smart Building concept? Please do not hesitate to contact us.

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