

The Edge

Creating the world's most sustainable and most connected office building by integrating smart technologies and collaborating closely with suppliers



The challenge

Modern office buildings require considerable flexibility to accommodate new uses and working patterns, and also need to meet high standards of sustainability.

When Deloitte Netherlands began envisaging their new Amsterdam office, they not only considered the working environment, but also the natural environment. That is to say, the building should have a double emphasis on productivity and sustainability. Moreover, the office would be extremely energy efficient with a strong emphasis on workplace efficiency.

The new building is planned to house the company's 1,700 local employees (previously spread over several buildings) in one modern space, creating a visible symbol of the company's digital approach and contemporary outlook.

Working in the digital age differs from traditional office life – it is much more flexible, decentralized and collaborative. In the digital age, employees are no longer desk-bound, or even office-bound; they might choose to work from home (at least a couple of days a week) and will go to the office mainly for meetings and social interaction with their colleagues. As such, it is not uncommon that 50% of desks in a conventional office are unoccupied at any one time during office hours – a waste of urban space, and a rallying call for a radically different building design and configuration of rooms.

This trend towards greater flexibility affects other types of construction too, of course. Transport infrastructure, for example, has to adjust to the growing numbers and changing tastes of travellers. Heathrow Terminal 5 in London was specifically designed as an adaptable building that can be easily transformed internally to cater for different demands.

As for the other dimension, sustainability, it is no longer a mere optional add-on offered by property developers, but a key feature of new buildings, actively promoted by developers and demanded by owners, tenants and end-users. The sustainable design is not just to comply with regulatory requirements, such as energy-efficiency specifications or renewable-energy policies, but also out of genuine environmental concern.

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The idea

Combine smart building design and innovative technologies to improve sustainability, workforce interaction and end-user experience.

Developed by OVG Real Estate and designed by PLP Architecture, The Edge was completed in November 2014. In its 40,000 square metres of floor space, it sets new standards in sustainability, technology, flexibility and user experience, and shows how smart building design can reduce energy demands. The most prominent architectural feature is the multi-storey, north-facing glass atrium, which admits abundant daylight while on the south façade concrete walls absorb heat (and shield the interior from sunlight), and solar panels on that façade and on the roof convert that sunlight into energy.

Perhaps the most innovative element of The Edge is the way that the many different elements of the building are interconnected, pushing the boundary of the Internet of Things. Every technical system in the building is controlled within a single network, enabling a live view of the building and modulated for maximum efficiency: the lift, the lighting and cooling systems, the robot that cruises around the building at night as a security guard, even the coffee machines and towel dispensers.

By working closely with suppliers, the developer introduced 21 innovations that had never been applied before, such as Philips' Ethernet-connected lighting and a safe plastic for cable insulations that is non-toxic in the event of fire. These and other solutions, according to Erik Ubels, Chief Technology Officer at OVG, are "integrated on the silicon level, instead of just gluing technologies together".

Consider the 6,000 low-energy LED luminaires, on which the lighting system is based: they contain multiple sensors for measuring temperature and light, and even for detecting movement. These sensors – and a further 28,000 positioned throughout the building – are linked to the building network and integrated into a data analytics platform enabling smart facility management. This helps, for example, guide cleaning staff to heavily used areas, or refilling the towel dispenser before it runs out, and allows predictive maintenance of the LED lights by monitoring their usage.



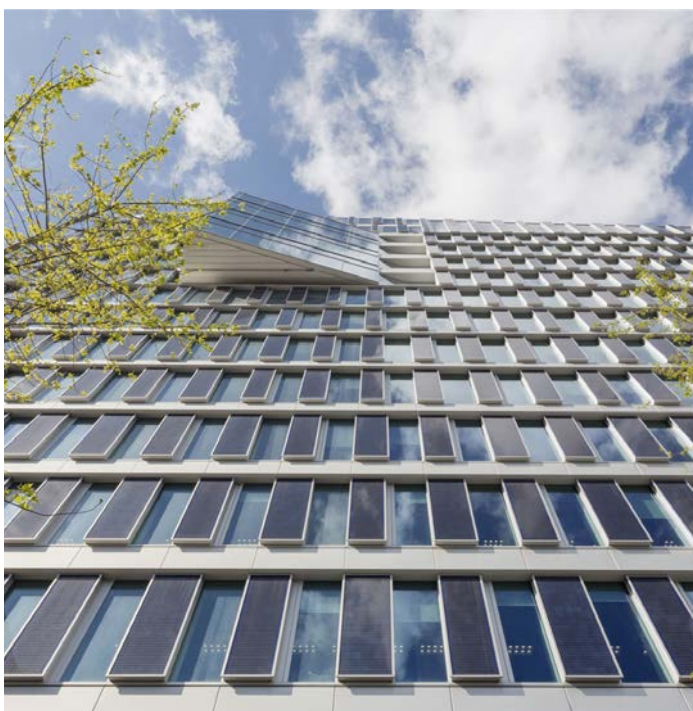
Further design features – from the layout of the central cafeteria to the positioning of the quiet zones – aim to enhance the user experience, and are based on interviews with users themselves and an analysis of their work patterns. One novelty is the building app, which employees can operate on their smartphones or tablets. The app allows employees to instantaneously adjust the lighting and heating at each workspace to their personal preference, reserve meeting rooms or parking places, track their progress in the on-site gym (treadmills are connected to the building's electricity grid, too), or locate their colleagues within the building.

The impact

The project has set new standards for sustainability and flexible working, while keeping O&M costs to a minimum.

The Edge is aptly named. It is at the very forefront of office-building accomplishment, maximizing the productivity of its occupants, minimizing the running costs and the environmental impact.

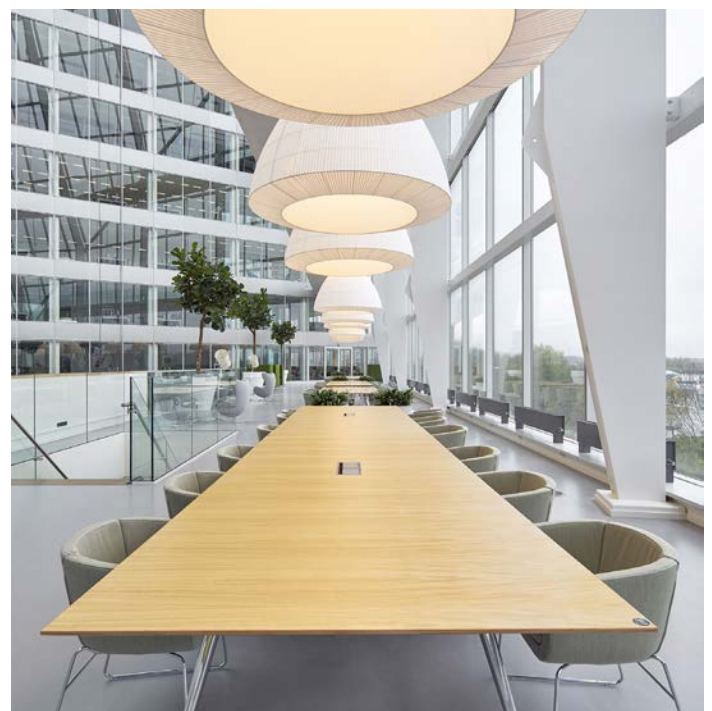
The office space's environmental impact is remarkably light. With a BREEAM rating (Building Research Establishment Environmental Assessment Method) of 98.36%, The Edge is widely considered the most sustainable office building in the world. Thanks to its solar panels (including some on rented roof space nearby), its aquifer thermal energy storage system (ATES), and, most importantly, demand reduction through such factors as efficient lighting and smart building design, the building's energy consumption is net negative – an estimated -0.3 kWh/m²/year versus +40.7 for a traditional office building. That translates into an estimated saving of 42 million kilograms of CO₂ in a decade. Another environmental feature is rainwater collected from the roof and balconies, and used for flushing the toilets and irrigating garden areas.



Office buildings are notoriously expensive to operate and maintain, but dramatic cost reductions are now possible thanks to technological advances and smart facility management. In the case of The Edge, the ventilation is to a large extent natural, effected by convection flows within the atrium, while heating and cooling are provided cost effectively via the ATES. The LED Ethernet-connected lighting system yields modest energy savings relative to conventional fluorescent-tube lighting systems, but an impressive savings on materials (notably, on cables) and repairs. The Edge's customized building analytics system reduces maintenance costs by remote monitoring of the actual use of the building and equipment. Cleaners and repair workers, for example, are directed promptly to the location where they are needed.

As for the productivity of the building's occupants, finally, and the user experience in general, The Edge offers many advantages. The layout might initially seem wasteful – the atrium and communication areas account for 25% of the building space, compared with just 10% in conventional office buildings, but it encourages productive interaction and dialogue between colleagues (and does not create extra cost as it does not need to be specifically conditioned). It is actually economical per employee: the flexible set-up, together with the smart data system and the building app, allows for accurate hot-desking, so much so that the building's 1,100 workspaces now serve more than 2,500 employees, even though originally intended for 1,700.

Coming as a surprise for the developer and the architect Ron Bakker, the atrium and cafeteria are actually one of the most popular work areas of the entire building, despite lacking specific sound insulation, and temperature, lighting as well as air movement are not



as controlled as required for typical workspaces.

User satisfaction is high. Many of the traditional frustrations of office life – paper jams, non-functioning equipment, double-booked meeting rooms – are now pre-empted by The Edge’s sensors and analytics. Employees can recharge their electric cars and bicycles for free in the garage, using the building’s self-generated excess power supply. And they can facilitate their work and personalize their workspace in numerous ways by deploying the building app. As it happens, many employees make little use of the app, but far from being regarded as a disappointment, this shortfall is interpreted favourably, as evidence that the building has now learned to respond unprompted to employees’ needs – for instance, by automatically regulating the lighting and heating to their preferred levels.

OVG has relocated its own headquarters to The Edge – appropriately enough, as the building serves as the company’s showcase project, generating global interest and positioning the company as an acknowledged leader of smart and sustainable building development. For Deloitte, the building has become part of its identity – an asset not just in branding and marketing its services, but also in recruiting; 62% of candidates specifically mention in their application that one of the factors attracting them to Deloitte is the prospect of working in The Edge.

The barriers to innovation, and the solutions

Financing, traditionalism, regulation – all presented challenges to the stakeholders, who responded boldly in collaboration with one another and with suppliers, and often made a virtue of necessity.

Planning for The Edge began in 2006. Just two years later, a serious challenge emerged, precipitated by the global financial crisis – a cut in available financing, coupled with a change in Deloitte’s specifications. Deloitte reduced its floor space requirement by 25%, or 10,000 square metres – meaning that it would no longer be the only tenant of the building. The team of developers and architects responded methodically to the challenge. First, they adjusted the design, adding

extra flexibility to accommodate additional tenants. This was done by subdividing the core office space, for example, and making provision for a second entrance. In fact, the building could today be radically repurposed at little cost and inconvenience to house a university, for instance. Second, the team achieved cost savings through value engineering, for example, by pre-fabricating parts of the building’s concrete southern façade.

Having initially envisioned a BREEAM rating of “excellent”, the team set themselves the challenge of going one better and achieving the highest rating, and finally to claim for The Edge the status of “greenest” office building in the world. The sustainability challenge here might appear to be at odds with the financial challenge: the additional solar panels, for instance, had not been budgeted for. The main investor ABN Amro had a strong interest in sustainability, and agreed to continue financing the project in 2010. In fact, in early October 2016, ABN Amro and OVG announced a further collaboration in smart retrofitting of old buildings, and the creation of the bank’s first green real estate loan.

The financial barriers facing any highly innovative project are never the only barriers. Almost inevitably, there will be technological barriers, and often resistance from potential partners and clients (especially in such a conservative industry as the construction industry) and regulatory barriers, too.

By taking a holistic view of the building in all its phases, and using the BREEAM rating system as a practical guide, team members were able to assess every relevant aspect and identify areas for improvement. They then initiated a continuous product-development process with their suppliers, prompting numerous refinements and innovations. One of the challenges in this regard was that many of the new technologies were untested, and the risk-averse engineering and construction industry was therefore reluctant to adopt them.

Sometimes even the technology suppliers seemed unwilling to move away from the status quo. Philips’ Ethernet-connected lighting system, according to one OVG executive, was something that initially Philips itself was wary of investing in. To overcome resistance of this kind, OVG worked closely with suppliers on developing the business case and proving the joint benefits. In the case of Ethernet-connected lighting, the three companies involved – Philips, OVG and Deloitte – eventually agreed to co-invest in the new system when the building was already nine storeys (with Philips taking the technology risk). Innovation-friendly had overcome risk-averse, and been vindicated. Today, Ethernet-connected lighting is a standard product in the Philips portfolio, having gained a competitive boost through being implemented in The Edge.

As for the various technological and sustainability challenges, the stakeholders addressed these by bringing together many different areas of expertise, from renewable energy to app design and Big Data. Client, developer, architect and contractor formed a multi-disciplinary core team, with a culture of open discussion, and an enthusiasm for innovation and boundary-pushing. One crucial factor was that the design team remained engaged



long after the initial design phase, contributing ideas throughout the construction process, and collaborating with suppliers – for instance, on developing that safe plastic for cable insulations. Another factor certainly was that Deloitte – particularly Erik Ubels, at the time still Chief Information Officer at Deloitte – was actively demanding innovation and willing to invest as long as the payback period was less than eight years.

Regarding regulatory barriers, some of the innovations fell afoul of the existing building codes. Whereas regulation prescribes a minimum lighting level of 500 Lux for workspaces, The Edge’s energy-efficient lighting allows employees the choice of working at a mere 300 Lux. The team resolved the matter by initiating an early dialogue with the municipal regulatory authorities, and securing their agreement. Of course, this pragmatic and solution-oriented approach, so characteristic of the consensual Dutch society, is an approach that many countries might be slower to adopt.

Needless to say, a few of the desired innovations could not be implemented. However, with digital technologies evolving so fast, some previously unaffordable (or even unimagined) innovations have meanwhile become available. One example is that of iBeacons, now successfully installed in OVG’s office space, and soon to be installed throughout the building. The Edge is about to become The Edge 2.0, with iBeacons and additional sensors enhancing both building performance and user experience. The data system will be able to track the location of each individual, create more accurate heatmaps of usage, and thereby analyse and model the actual behaviour patterns within the building, and help its users become even more productive and fulfilled – making even the scanning of a QR or RFID tag redundant when checking into meeting rooms.



Lessons learned

- **Take user needs and wishes as the starting point for design and engineering.**
With the help of user studies and interviews, the architects gained an early and accurate understanding of the client’s needs and preferences; combining open spaces with focus rooms and quiet zones to allow for different usages during a typical working day – phone conferences, informal meetings and tasks requiring high-focus.
- **Create a project team that is multi-functional and highly motivated.**
The central team driving the project contained representatives from the developer, designer, contractor and client; they brought their varied talents together in a highly creative way, aided by their common enthusiasm for innovation and their shared commitment to an open discussion culture.
- **Collaborate with suppliers to help them market their innovations.**
OVG quickly realized that technology suppliers are often a valuable source of innovation, but often lack the right business model to market their innovative products. By working closely with these suppliers and startups (e.g., for the building app), OVG was able to integrate these innovations into the building without increasing costs while minimizing technology risks.
- **Involve the regulator early on in the process.**
The municipality was invited to participate in the central project meetings; pragmatic solutions to work within the pre-existing regulations were then developed jointly that incorporated ambitious innovations.



Case Study prepared by the Boston Consulting Group as part of the Future of Construction Project at the World Economic Forum



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